Table 4. Analytical Results for Ground Water - Fuel Oxygenates Lead Scavengers - Redwood Oil Bulk Plant - 455 Yolanda Avenue, Santa Rosa, California

Well ID	Sample Date	Tert-Butanol	MTBE	Diisopropyl Ether	Ethyl-tert-butyl-ether	Lead Scavengers	Tert-Amylmethyl ether	Notes
		<----------ppb---------->						
MW-1	3/6/1996	---	830	---	---	---	---	
	10/18/1996	---	400	---	---	---	---	
	4/9/1997	---	900	---	---	---	---	
	10/29/1997	---	360	---	---	---	---	
	4/7/1998	---	63,000	---	---	---	---	
	10/7/1998	ND	25,000	ND	ND	---	ND	
	4/7/1999	---	1,700	---	---	---	---	
	10/19/1999	---	3,200	---	---	---	---	
	4/26/2000	---	---	---	---	---	---	
	10/31/2000	500	740	<120	<120	<50	<120	No lead was detected at detection limits of 1,000 ppb.
	2/2/2001	<200	660	<50	<50	<50	<50	
	4/23/2001	670	3,800	<100	<100	<100	<100	
	7/23/2001	100	750	<25	<25	<25	<25	
	10/23/2001	110	1,300	<25	<25	<25	<25	
	1/22/2002	24	7.2	<5	<5	—	<5	
	4/25/2002	<200	22	<1	<1	<1	<1	
	7/23/2002	<200	16	<1	<1	<1	1	
	1/29/2003	<200	<1	<1	<1	<1	<1	
	7/22/2003	<200	8	<1	<1	<1	<1	
	1/20/2004	<5	4	<1	<1	<1	<1	
	1/18/2005	<5	2.9	<0.5	<0.5	<1	1	
MW-2	3/6/1996	---	250,000	---	---	---	---	
	10/18/1996	---	600,000	---	---	---	---	
	4/10/1997	---	210,000	---	---	---	---	
	10/30/1997	36	200,000	---	---	---	11	
	4/7/1998	---	35,000	---	---	---	---	
	10/7/1998	ND	100,000	ND	ND	---	ND	
	4/7/1999	---	4,200	---	---	---	---	
	10/19/1999	---	110,000	---	---	---	---	
	4/26/2000	---	---	---	---	---	---	
	10/31/2000	22,000	32,000	<5000	<5000	<2000	<5000	No lead was detected at detection limits of 1,000 ppb.
	2/2/2001	<10,000	31,000	<2,500	<2,500	<2,500	<2,500	
	4/23/2001	15,000	8,900	<500	<500	<500	<500	
	7/23/2001	7,600	17,000	<1,000	<1,000	<1,000	<1,000	

Table 4. Analytical Results for Ground Water - Fuel Oxygenates Lead Scavengers - Redwood Oil Bulk Plant - 455 Yolanda Avenue, Santa Rosa, California

Well ID	Sample Date	Tert-Butanol	MTBE	Diisopropyl Ether	Ethyl-tert-butyl-ether	Lead Scavengers	Tert-Amylmethyl ether	Notes
		<----------ppb---------->						
MW-2	10/23/2001	6,500	14,000	<250	<250	<250	590	
	2/21/2002	1,300	210	<50	<50	---	<50	
	4/25/2002	2,100	1,300	<10	<10	<10	83	
	7/23/2002	1,800	3,400	<1	<1	<1	140	
	10/22/2002	4,000	14,000	<1,250	<1,250	<1,250	<1,250	
	1/28/2003	260	590	<1	<1	<1	18	
	4/22/2003	<200	100	<1	<1	<1	4	
	7/22/2003	<200	38	<1	<1	<1	3	
	1/20/2004	<5	16	<1	<1	<1	2	
	7/19/2004	<5	22	<0.5	<0.5	<0.5	4.7	
	1/18/2005	<5	13	<0.5	<0.5	<1	2.5	
	7/12/2005	**<5**	**8.0**	**<0.5**	**<0.5**	**<0.5**	**<0.5**	
MW-3	3/6/1996	---	190,000	---	---	---	---	
	10/18/1996	---	370,000	---	---	---	---	
	4/9/1997	---	---	---	---	---	---	
	10/29/1997	---	---	---	---	---	---	
	4/7/1998	---	230,000	---	---	---	---	
	10/7/1998	ND	190,000	ND	ND	---	ND	
	4/7/1999	---	110,000	---	---	---	---	
	10/19/1999	---	95,000	---	---	---	---	
	4/26/2000	---	---	---	---	---	---	
	10/31/2000	---	---	---	---	---	---	Well plugged at seven feet, therefore not sampled
	2/2/2001	11,000	41,000	<2,500	<2,500	<2,500	<2,500	
	4/23/2001	---	---	---	---	---	---	Well inaccessaable
	7/23/2001	12,000	38,000	<1,000	<1,000	<1,000	1,800	
	10/23/2001	<20,000	62,000	<5,000	<5,000	<5,000	<5,000	
	1/22/2002	32,000	14,000	<2,500	<2,500	---	3,300	
	4/25/2002	<20,000	34,000	<100	<100	<100	770	
	7/23/2002	6,300	39,000	<1	6	<1	940	
	10/22/2002	<5,000	25,000	<2,500	<2,500	<2,500	<2,500	
	1/28/2003	2,900	15,000	<1	2	<1	450	
	4/22/2003	7,100	39,000	<1	4	<1	1,400	
	7/22/2003	16,000	47,000	<1	6	<1	1,400	
	1/20/2004	3,100	42,000	<1	4	1	1,200	
	7/19/2004	17,000	47,000	<5	7	<5	1,900	
	1/18/2005	4,100	25,000	<25	<25	<50	850	
	7/12/2005	**11,000**	**38,000**	**<0.5**	**5.9**	**<1**	**900**	

Table 4. Analytical Results for Ground Water - Fuel Oxygenates Lead Scavengers - Redwood Oil Bulk Plant - 455 Yolanda Avenue, Santa Rosa, California

Well ID	Sample Date	Tert-Butanol	MTBE	Diisopropyl Ether	Ethyl-tert-butyl-ether	Lead Scavengers	Tert-Amylmethyl ether	Notes
		<----------ppb---------->						
MW-4	3/6/1996	---	6,400	---	---	---	---	
	10/21/1996	---	52,000	---	---	---	---	
	4/10/1997	---	95,000	---	---	---	---	
	10/29/1997	---	95,000	---	---	---	---	
	4/8/1998	---	34,000	---	---	---	---	
	10/7/1998	ND	170,000	ND	ND	---	ND	
	4/7/1999	---	87,000	---	---	---	---	
	10/19/1999	---	100,000	---	---	---	---	
	4/26/2000	130,000	170,000	<5,000	<5,000	---	<5,000	
	10/31/2000	36,000	54,000	<5,000	<5,000	---	<5,000	
	2/2/2001	<40	130	<10	<10	<10	68	
	4/23/2001	19,000	58,000	<1,000	<1,000	<1,000	1,500	
	7/23/2001	<10,000	49,000	<2,500	<2,500	<2,500	<2,500	
	10/23/2001	13,000	54,000	<1,250	<1,250	<1,250	1,400	
	1/22/2002	2,500	1,300	<125	<125	—	160	
	4/25/2002	<2,000	3,200	<10	<10	<10	65	
	7/23/2002	200	4,200	<1	<1	<1	60	
	10/22/2002	<500	4,200	<250	<250	<250	<250	
	1/27/2003	<200	70	<1	<1	<1	2	
	4/22/2003	<200	380	<1	<1	<1	6	
	7/22/2003	<200	900	<1	<1	<1	15	
	1/20/2004	<5	19	<1	<1	<1	1	
	7/19/2004	<5	530	<0.5	<0.5	<0.5	8	
	1/18/2005	<5	3.8	<0.5	<0.5	<1	1.8	
	7/12/2005	**7.0**	**69**	**<0.5**	**<0.5**	**<1**	**0.9**	
MW-5	3/6/1996	---	<5	---	---	---	---	
	10/18/1996	---	<5	---	---	---	---	
	4/9/1997	---	<5	---	---	---	---	
	10/29/1997	---	<5	---	---	---	---	
	4/7/1998	---	24	---	---	---	---	
	10/7/1998	ND	<5	ND	ND	---	ND	
	4/7/1999	---	<0.5	---	---	---	---	
	10/19/1999	---	67	---	---	---	---	
	4/26/2000	<10	<2.03	<5.0	<5.0	---	<5.0	
	10/31/2000	---	---	---	---	---	---	Well inaccessaable
	2/2/2001	<20	<5.0	<5.0	<5.0	<5.0	<5.0	
	10/23/2001	<20	<5	<5	<5	<5	<5	
	1/28/2003	<200	2	<1	<1	<1	<1	
	5/23/2005	<5	<0.5	<0.5	<0.5		<0.5	

Table 4. Analytical Results for Ground Water - Fuel Oxygenates Lead Scavengers - Redwood Oil Bulk Plant - 455 Yolanda Avenue, Santa Rosa, California

Well ID	Sample Date	Tert-Butanol	MTBE	Diisopropyl Ether	Ethyl-tert-butyl-ether	Lead Scavengers	Tert-Amylmethyl ether	Notes
		<----------ppb---------->						
MW-5A	10/18/1996	---	<5	---	---	---	---	
	4/10/1997	---	26	---	---	---	---	
	10/29/1997	---	<5	---	---	---	---	
	4/7/1998	---	<5	---	---	---	---	
	10/7/1998	ND	<5	ND	ND	---	ND	
	4/7/1999	---	<0.5	---	---	---	---	
	10/19/1999	---	---	---	---	---	---	
	4/26/2000	<10	<2.03	<5.0	<5.0	---	<5.0	
	10/31/2000	---	---	---	---	---	---	Well inaccessaable
	2/2/2001	<20	7.1	<5.0	<5.0	<5.0	<5.0	
	10/23/2001	<20	<5	<5	<5	<5	<5	
	1/28/2003	280	1,900	<1	<1	<1	58	
	5/23/2005	390	28	<0.5	<0.5		<0.5	
MW-7	3/6/1996	---	10	---	---	---	---	
	10/18/1996	---	60	---	---	---	---	
	4/9/1997	---	<5	---	---	---	---	
	10/29/1997	---	17	---	---	---	---	
	4/7/1998	---	9.6	---	---	---	---	
	10/7/1998	ND	<5	ND	ND	---	ND	
	4/7/1999	---	31	---	---	---	---	
	10/19/1999	---	3.6	---	---	---	---	
	4/26/2000	<10	<2.03	<5.0	<5.0	---	<5.0	
	10/31/2000	41,000	63,000	<5000	<5000	<2000	<5000	No lead was detected at detection limits of 1,000 ppb.
	4/23/2001	<20	15	<5.0	<5.0	<5.0	<5.0	
	10/23/2001	<20	11	<5	<5	<5	<5	
	1/27/2003	<200	890	<1	<1	<1	19	
	1/20/2004	24	290	<1	<1	<1	18	
	1/18/2005	93	1,300	<0.5	<0.5	<1	22	
MW-8	3/6/1996	---	6	---	---	---	---	
	10/21/1996	---	<5	---	---	---	---	
	4/10/1997	---	<5	---	---	---	---	
	4/10/1997	---	<5	---	---	---	---	
	10/30/1997	---	<5	---	---	---	---	
	4/8/1998	---	29	---	---	---	---	
	10/7/1998	ND	75	ND	ND	---	ND	
	4/7/1999	---	280	---	---	---	---	

Table 4. Analytical Results for Ground Water - Fuel Oxygenates Lead Scavengers - Redwood Oil Bulk Plant - 455 Yolanda Avenue, Santa Rosa, California

Well ID	Sample Date	Tert-Butanol	MTBE	Diisopropyl Ether	Ethyl-tert-butyl-ether	Lead Scavengers	Tert-Amylmethyl ether	Notes
		<----------ppb---------->						
MW-8	10/19/1999	---	250	---	---	---	---	
	4/26/2000	<10	<2.03	<5.0	<5.0	---	<5.0	
	10/31/2000	120	190	<50	<50	<20	<50	No lead was detected at detection limits of 1,000 ppb.
	10/23/2001	<100	690	<25	<25	<25	<25	
	1/27/2003	<200	1,300	<1	<1	<1	24	
MW-9	10/18/1996	---	150	---	---	---	---	
	4/10/1997	---	2,200	---	---	---	---	
	10/29/1997	---	4,600	---	---	---	---	
	4/8/1998	---	450	---	---	---	---	
	10/7/1998	ND	1,000	ND	ND	---	ND	
	4/7/1999	---	260	---	---	---	---	
	10/19/1999	---	97	---	---	---	---	
	4/26/2000	<10	193	<5.0	<5.0	---	<5.0	
	10/31/2000	14	22	<5.0	<5.0	<2.0	<5.0	
	10/23/2001	<100	890	<25	<25	<25	<25	
	1/27/2003	<200	440	<1	<1	<1	8	
	1/20/2004	<5	93	<1	<1	<1	4	
	1/18/2005	<5	54	<0.5	<0.5	<1	1.7	
MW-10	4/26/2000	<10,000	210,004	<5,000	<5,000	---	<5,000	
	10/31/2000	23,000	35,000	<5000	<5000	<2000	<5000	
	2/2/2001	<20,000	51,000	<5,000	<5,000	<5,000	<5,000	
	4/23/2001	5,400	27,000	<1,000	<1,000	<1,000	<1,000	
	7/23/2001	<10,000	46,000	<2,500	<2,500	<5 / <2,500	<2,500	
	10/23/2001	9,400	59,000	<1,250	<1,250	<1,250	1,400	
	1/22/2002	32,000	18,000	<1,250	<1,250	—	1,800	
	4/25/2002	<20,000	36,000	<100	<100	<100	1,200	
	7/23/2002	5,000	34,000	<1	5	<1	910	
	10/22/2002	<10,000	46,000	<5,000	<5,000	<5,000	<5,000	
	1/27/2003	3,100	23,000	<1	4	<1	720	
	4/22/2003	910	7,100	<1	<1	<1	220	
	7/22/2003	4,000	15,000	5	3	<1	490	
	1/20/2004	520	7,300	1	<1	<1	170	
	1/18/2005	900	2,200	4	<0.5	<1	100	

Table 4. Analytical Results for Ground Water - Fuel Oxygenates Lead Scavengers - Redwood Oil Bulk Plant - 455 Yolanda Avenue, Santa Rosa, California

Well ID	Sample Date	Tert-Butanol	MTBE	Diisopropyl Ether	Ethyl-tert-butyl-ether	Lead Scavengers	Tert-Amylmethyl ether	Notes
		<----------ppb---------->						
MW-11	5/8/2000	<100	150	<50	<50	---	<50	
	10/31/2000	140	280	<50	<50	<20	<50	
	2/2/2001	<100	310	<25	<25	<25	<25	
	4/23/2001	<20	17	<5.0	<5.0	<5.0	<5.0	
	7/23/2001	<20	68	<5.0	<5.0	<5.0	<5.0	
	10/23/2001	<20	99	<5	<5	<5	<5	
	1/22/2002	110	43	<10	<10	<10	<10	
	4/25/2002	<200	38	<1	<1	<1	<1	
	7/23/2002	<200	60	<1	<1	<1	<1	
	5/23/2005	<5	9.5	<0.5	<0.5		<0.5	
MW-12	5/8/2000	<10	3.2	<5.0	<5.0	---	<5.0	
	10/31/2000	<10	<2.0	<5.0	<5.0	<2.0	<5.0	
	2/2/2001	<20	<5.0	<5.0	<5.0	<5.0	<5.0	
	4/23/2001	<20	<5.0	<5.0	<5.0	<5.0	<5.0	
	7/23/2001	<20	<5.0	<5.0	<5.0	<5.0	<5.0	
	10/23/2001	<20	<5	<5	<5	<5	<5	
	1/22/2002	<20	<5	<5	<5	<5	<5	
	4/25/2002	<200	<1	<1	<1	<1	<1	
	7/23/2002	<200	<1	<1	<1	<1	<1	
	5/23/2005	<5	<0.5	<0.5	<0.5		<0.5	
MW-13	5/8/2000	<10	<2.0	<5.0	<5.0	---	<5.0	
	10/31/2000	<10	<2.0	<5.0	<5.0	<2.0	<5.0	
	2/2/2001	<20	<5.0	<5.0	<5.0	<5.0	<5.0	
	4/23/2001	<20	<5.0	<5.0	<5.0	<5.0	<5.0	
	7/23/2001	<20	<5.0	<5.0	<5.0	<5.0	<5.0	
	10/23/2001	<20	<5	<5	<5	<5	<5	Well has been abanadoned.
MW-14	5/8/2000	<10	<2.0	<5.0	<5.0	---	<5.0	
	10/31/2000	<10	<2.0	<5.0	<5.0	<2.0	<5.0	
	2/2/2001	<20	<5.0	<5.0	<5.0	<5.0	<5.0	
	4/23/2001	<20	<5.0	<5.0	<5.0	<5.0	<5.0	
	7/23/2001	<20	<5.0	<5.0	<5.0	<5.0	<5.0	
	10/23/2001	<20	<5	<5	<5	<5	<5	Well has been abanadoned.

Table 4. Anasults for Ground Water - Fuel Oxygenates Lead Scavengers - Redwood Oil Bulk Plant - 455 Yolanda Avenue, Santa Rosa, California

Well ID	Date	Tert-Butanol	MTBE	Diisopropyl Ether	Ethyl-tert-butyl-ether	Lead Scavengers	Tert-Amylmethyl ether	Notes
		<----------ppb---------->						
MW-15	8/2000	<10	<2.0	<5.0	<5.0	---	<5.0	
	1/2000	<10	<2.0	<5.0	<5.0	<2.0	<5.0	
	3/2001	<20	<5	<5	<5	<5	<5	
	7/2003	<200	<1	<1	<1	<1	<1	
	3/2005	<5	<0.5	<0.5	<0.5		<0.5	
MW-16	8/2000	<10	<2.0	<5.0	<5.0	---	<5.0	
	1/2000	<10	<2.0	<5.0	<5.0	<2.0	<5.0	
	3/2001	<20	<5	<5	<5	<5	<5	
	7/2003	<200	1	<1	<1	<1	<1	
	3/2005	<5	<0.5	<0.5	<0.5		<0.5	
MW-17	8/2000	<10	<2.0	<5.0	<5.0	---	<5.0	
	1/2000	<10	<2.0	<5.0	<5.0	<2.0	<5.0	
	3/2001	<20	<5	<5	<5	<5	<5	
	7/2005	<10	<1.0	<5.0	<5.0		<5.0	
MW-18	8/2000	<10	<2.0	<5.0	<5.0	---	<5.0	
	1/2000	<10	<2.0	<5.0	<5.0	<2.0	<5.0	
	3/2001	<20	<5	<5	<5	<5	<5	
	7/2003	<200	<1	<1	<1	<1	<1	
	3/2005	<5	<0.5	<0.5	<0.5		<0.5	
MW-19	8/2000	<10	<2.0	<5.0	<5.0	---	<5.0	
	1/2000	<10	<2.0	5.0	<5.0	<2.0	<5.0	
	3/2001	<20	<5	<5	<5	<5	<5	
	3/2005	<5	<0.5	<0.5	<0.5		<0.5	
MW-20	8/2000	<10	<2.0	<5.0	<5.0	---	<5.0	
	1/2000	<10	<2.0	<5.0	<5.0	<2.0	<5.0	
	3/2001	<20	<5	<5	<5	<5	<5	
	3/2005	1.0	<0.5	<0.5	<0.5		<0.5	

Table 4. Analytical Results for Ground Water - Fuel Oxygenates Lead Scavengers - Redwood Oil Bulk Plant - 455 Yolanda Avenue, Santa Rosa, California

Well ID	Sample Date	Tert-Butanol	MTBE	Diisopropyl Ether	Ethyl-tert-butyl-ether	Lead Scavengers	Tert-Amylmethyl ether	Notes
		<----------ppb---------->						
V-1	3/6/1996	---	<1,000	---	---		---	
	10/18/1996	---	<1,000	---	---		---	
	4/9/1997	---	1,200	---	---		---	
	10/29/1997	---	---	---	---		---	
	4/7/1998	---	1,900	---	---		---	
	10/7/1998	ND	<100	ND	ND		ND	
	4/7/1999	---	100	---	---		---	
	10/19/1999	---	<50	---	---		---	
	4/26/2000	<10,000	65,004	<5,000	<5,000		<5,000	
	10/31/2000	<1,000	<200	<500	<500	<200	<500	No lead was detected at detection limits of 1,000 ppb.
	2/26/2001	<100	<25	<25	<25	<25	<25	
	4/23/2001	23	15	<5.0	<5.0	<5.0	<5.0	
	7/23/2001	<40	16	<10	<10	<10	<10	
	10/23/2001	28	13	<5	<5	<5	<5	
	1/22/2002	360	<100	<100	<100	---	<100	
	1/22/2002	<400	<100	<100	<100	---	<100	Lab reissued data with corrected Tert-butanol results.
	4/25/2002	<2,000	12	<10	<10	<10	<10	
	7/23/2002	<200	10	<1	<1	<1	<1	
	1/28/2003	<200	6	<1	<1	<1	<1	
	7/22/2003	<200	7	<1	<1	<1	<1	
	5/23/2005	<5	0.6	<0.5	<0.5		<0.5	
V-2	3/6/1996	---	6,000	---	---		---	
	10/18/1996	---	40,000	---	---		---	
	4/9/1997	---	80,000	---	---		---	
	10/30/1997	---	68,000	---	---		---	
	4/7/1998	---	77,000	---	---		---	
	10/7/1998	ND	120,000	ND	ND		ND	
	4/7/1999	---	98,000	---	---		---	
	10/19/1999	---	79,000	---	---		---	
	4/26/2000	57,000	940,004	<5,000	<5,000		<5,000	
	10/31/2000	<10	8.1	<5.0	<5.0	<2.0	<5.0	
	2/26/2001	<20,000	130,000	<5,000	<5,000	<5,000	<5,000	
	4/23/2001	20,000	47,000	<1,000	<1,000	<1,000	<1,000	
	7/23/2001	—	—	—	—	—	----	Well no longer sampled. It has been switched to a SVE (soil vapor extraction) well.

Table 4. Analytical Results for Ground Water - Fuel Oxygenates Leadngers - Redwood Oil Bulk Plant - 455 Yolanda Avenue, Santa Rosa, California

Well ID	Sample Date	Tert-Butanol	MTBE	Diisopropyl Ether	Etl-butyl-etl	Lead Scavengers	Tert-Amylmethyl ether	Notes
		<----------	----------	----------	----------	----------	---------->	
DW-2	10/21/1996	---	540	---	---		---	
	4/10/1997	---	560	---	---		---	
	10/30/1997	---	1,500	---	---		---	
	4/8/1998	---	1,300	---	---		---	
	10/7/1998	ND	2,300	ND	ND		ND	
	4/7/1999	---	3,500	---	---		---	
DW-468	4/2/1998	ND	<5	ND	ND		ND	
	7/31/1998	ND	<5	ND	ND		ND	
	10/7/1998	---	<0.5	---	---		---	
	4/7/1999	---	<0.5	---	---		---	
	10/19/1999	---	<0.5	---	---		---	
	4/26/2000	<10	<2.03	<5.0	<5.0		<5.0	
	5/26/2000	<10	<2.0	<5.0	<5.0	---	<5.0	
	6/26/2000	---	---	---	---	---	---	
	7/21/2000	---	---	---	---	---	---	
	8/29/2000	---	---	---	---	---	---	
	10/2/2000	<10	<2.0	<5.0	<5.0	<2.0	<5.0	No lead was detected at detection limits of 1,000 ppb.
	10/31/2000	<10	<2.0	<5.0	<5.0	<2.0	<5.0	
	11/30/2000	<10	<2.0	<5.0	<5.0	<2.0	<5.0	
	12/19/2000	<10	<2.0	<5.0	<5.0	<2.0	<5.0	
	2/2/2001	<20	<5.0	<5.0	<5.0	<5.0	<5.0	
	3/23/2001	<10.0	<2.0	<5.0	<5.0	<2.0	<5.0	
	4/23/2001	<20	<5.0	<5.0	<5.0	<5.0	<5.0	
	5/14/2001	<20	<5.0	<5.0	<5.0	<5.0	<5.0	
	6/18/2001	<20	<5.0	<5.0	<5.0	<5.0	<5.0	
	7/23/2001	<20	<5.0	<5.0	<5.0	<5.0	<5.0	
	8/22/2001	<20	<5	<5	<5	<5	<5	
	9/13/2001	<20	<5	<5	<5	<5	<5	
	10/23/2001	<20	<5	<5	<5	<5	<5	
	11/20/2001	<20	<5	<5	<5	<5	<5	
	12/4/2001	<20	<5	<5	<5	<5	<5	Well has been taken out of service
DW-404	6/22/2001	<20	<5.0	<5.0	<5.0	—	<5.0	
	7/23/2001	<20	<5.0	<5.0	<5.0	<5.0	<5.0	
	8/22/2001	<20	<5	<5	<5	<5	<5	
	9/13/2001	<20	<5	<5	<5	<5	<5	
	10/23/2001	<20	<5	<5	<5	<5	<5	
	11/20/2001	<20	<5	<5	<5	<5	<5	
	12/4/2001	<20	<5	<5	<5	<5	<5	Well has been taken out of service.

Table 4. Analytical Results for Ground Water - Fuel Oxygenates Lead Scavengers - Redwood Oil Bulk Plant - 455 Yolanda Avenue, Santa Rosa, California

Well ID	Sample Date	Tert-Butanol	MTBE	Diisopropyl Ether	Ethyl-tert-butyl-ether	Lead Scavengers	Tert-Amylmethyl ether	Notes
		<----------ppb---------->						
AQU-2	5/23/2005	<5	190	<0.5	0.5	---	3.6	
G1	4/16/1996		---	---	---	---	---	
G2	4/16/1996		---	---	---	---	---	
G3	4/16/1996		---	---	---	---	---	
G4	4/16/1996	---	---	---	---	---	---	
G6/MW-105	4/16/1996	---	---	---	---	---	---	
G76	4/16/1996	---	---	---	---	---	---	
G8	4/16/1996	---	---	---	---	---	---	
G9	4/16/1996	---	---	---	---	---	---	
G10	4/16/1996	---	---	---	---	---	---	
G11	4/15/1998	<5	7.1	<5	<5	<5	<5	
G12	4/15/1998	<5	9.9	<5	<5	<5	<5	
G13	4/15/1998	<5	120	<5	<5	<5	<5	
G14	4/15/1998	<5	<5	<5	<5	<5	<5	
G15	4/15/1998	36	880	<5	<5	<5	11	
G16	4/15/1998	<5	<5	<5	<5	<5	<5	
G17	4/15/1998	<5	<5	<5	<5	<5	<5	
G18	9/11/1998	<5	210	<5	<5	<5	<5	
G19	9/11/1998	<5	---	<5	<5	<5	<5	
G20	9/11/1998	<5	<1	<5	<5	<5	<5	
G21	9/11/1998	<5	---	<5	<5	<5	<5	

Table 4. Analytical Results for Ground Water - Fuel Oxys Lead Scavengers - Redwood Oil Bulk Plant - 455 Yolanda Avenue, Santa Rosa, California

Well ID	Sample Date	Tert-Butanol	MTBE	Diiyl Eth	Ethyl-tert-butyl-ether	Lead Scavengers	Tert-Amylmethyl ether	Notes
		<----------ppb---------->						
TSP-1@29'	5/3/2000	20,000	25,000	<5(	<500	---	<500	
TSP-1@38'	5/3/2000	15,000	17,000	<5(	<500	---	<500	
TSP-2@33'	5/1/2000	660	1,400	<5	<50	---	<50	
TSP-2@48'	5/1/2000	2,800	5,500	<1	<100	---	<100	
TSP-2@62'	5/2/2000	290	440	<5	<50	---	<50	
TSP-3@30'	5/2/2000	460	620	<5	<50	---	<50	
TSP-3@65'	5/3/2000	<10	<2.0	<5	<5.0	---	<5.0	
TSP-4@40'	5/2/2000	<10	<2.0	<5	<5.0	---	<5.0	
TSP-5@50'	5/3/2000	<10	<2.0	<5	<5.0	---	<5.0	

Explanation:

MTBE: Methyl tertiary-butyl ether

Table B: Analytic Results for Groundwater: Oxygenates - May 2005 Sampling Event - Redwood Oil Bulk Plant, 455 yolanda Avenue, Santa Rosa, California

Well ID	Sample Date	Tert-Butanol	MTBE	Diisopropyl Ether	Ethyl-tert-butyl-ether	Tert-Amylmethyl ether	Notes
		ppb					
MW-5	5/23/2005	<5	<0.5	<0.5	<0.5	<0.5	
MW-5A	5/23/2005	390	28	<0.5	<0.5	<0.5	
MW-11	5/23/2005	<5	9.5	<0.5	<0.5	<0.5	
MW-12	5/23/2005	<5	<0.5	<0.5	<0.5	<0.5	
MW-15	5/23/2005	<5	<0.5	<0.5	<0.5	<0.5	
MW-16	5/23/2005	<5	<0.5	<0.5	<0.5	<0.5	
MW-17	6/7/2005	<10	<1.0	<5.0	<5.0	<5.0	
MW-18	5/23/2005	<5	<0.5	<0.5	<0.5	<0.5	
MW-19	5/23/2005	<5	<0.5	<0.5	<0.5	<0.5	
MW-20	5/23/2005	1.0	<0.5	<0.5	<0.5	<0.5	
MW-24d25	5/25/2005	13	43	<0.5	<0.5	<0.5	
MW-24d73	5/25/2005	<5	<0.5	<0.5	<0.5	<0.5	
MW-24d146	5/25/2005	17	1	<0.5	<0.5	<0.5	
MW-24d178	5/25/2005	<5	<0.5	<0.5	<0.5	<0.5	
MW-25d25	5/26/2005	<5	<0.5	<0.5	<0.5	<0.5	
MW-25d75	5/26/2005	<5	<0.5	<0.5	<0.5	<0.5	
MW-25d145	5/26/2005	19	<0.5	0.6	<0.5	<0.5	
MW-25d180	5/26/2005	20	<0.5	1	<0.5	<0.5	
MW-25d230	5/26/2005	17	<0.5	0.9	<0.5	<0.5	
MW-27d25	5/26/2005	<5	<0.5	<0.5	<0.5	<0.5	
MW-27d75	5/26/2005	24	<0.5	<0.5	<0.5	<0.5	
MW-27d145	5/26/2005	<5	<0.5	<0.5	<0.5	<0.5	
MW-27d180	5/26/2005	<5	<0.5	<0.5	<0.5	<0.5	
MW-27d230	5/26/2005	30	<0.5	0.7	<0.5	<0.5	

Table B: Analytic Results for Groundwater: Oxygenates - May 2005 Sampling Event - Redwood Oil Bulk Plant, 455 yolanda Avenue, Santa Rosa, California

Well ID	Sample Date	Tert-Butanol	MTBE	Diisopropyl Ether	Ethyl-tert-butyl-ether	Tert-Amylmethyl ether	Notes
		ppb					
MW-29d23	5/25/2005	11	<0.5	<0.5	<0.5	<0.5	
MW-29d73	5/25/2005	8	<0.5	<0.5	<0.5	<0.5	
MW-29d145	5/25/2005	9	<0.5	<0.5	<0.5	<0.5	
MW-29d180	5/25/2005	8	<0.5	<0.5	<0.5	<0.5	
V-1	5/23/2005	<5	0.6	<0.5	<0.5	<0.5	
AQU-2	5/23/2005	<5	190	<0.5	0.5	3.6	

Notes:
Samples were tested for ethanol and for lead scavengers 1,2-Dichloroethane (EDC) and 1,2-Dibromoethane (EDB).
Results for all samples were non-detect at ethanol detection limit of <1,000 ppb and lead scavengers detection limit of <0.5 ppb
Results for sample MW-17 were non-detect at ethanol detection limit of <100 ppb and lead scavengers detection limit of <0.5 ppb

ble 5. Analytical Results for Ground Water in Multi-Level Wells - Fuel Oxygenates and Lead Scavengers - Redwood Oil Bulk Plant - 455 Yolanda Ave, Santa Rosa, California

Well ID	Sample Date	Sample Depth (in feet)	Lead Scavengers	Diisopropyl Ether	Ethyl-tert-butyl-Ether	MTBE	tert-Amyl Methyl Ether	tert-Butanol
			<---------- ppb ---------->					
MW-21	2/26/01	24	<100	<100	<100	2,100	<100	810
	2/26/01	50	<50	<50	<50	710	<50	340
	2/26/01	75	<500	<500	<500	8,900	<500	<2,000
	2/26/01	110	<100	<100	<100	1,400	<100	650
	2/26/01	143	<50	<50	<50	900	<50	420
	2/26/01	158	<25	<25	<25	580	<25	270
	2/26/01	165.5	<100	<100	<100	1,100	<100	<400
	4/26/01	24	---	<500	<500	9,400	<500	7,500
	4/26/01	50	---	<50	<50	1,000	<50	430
	4/26/01	75	---	<1,000	<1,000	17,000	<1,000	<4,000
	4/26/01	110	---	<25	<25	660	<25	200
	4/26/01	143	---	<50	<50	1,100	<50	320
	4/26/01	158	---	<25	<25	400	<25	<100
	4/26/01	165.5	---	<100	<100	2,300	<100	480
	7/25/01	24	<250	<250	<250	6,300	<250	4,600
	7/25/01	75	<500	<500	<500	18,000	<500	2,800
	7/25/01	143	<25	<25	<25	990	<25	250
	7/25/01	165.5	<100	<100	<100	2,100	<100	460
	10/25/01	24	<25	<25	<25	310	<25	1,200
	10/25/01	75	<500	<500	<500	16,000	<500	23,000
	10/25/01	143	<50	<50	<50	790	<50	1,200
	10/25/01	165.5	<100	<100	<100	2,000	<100	3,100

Table 5. Analytical Results for Ground Water in Multi-Level Wells - Fuel Oxygenates and Lead Scavengers - Redwood Oil Bulk Plant - 455 Yolanda Ave, Santa Rosa, California

Well ID	Sample Date	Sample Depth (in feet)	Lead Scavengers	Diisopropyl Ether	Ethyl-tert-butyl-Ether	MTBE	tert-Amyl Methyl Ether	tert-Butanol
			<---------- ppb ---------->					
MW-21 cont	1/24/02	24	<5	<5	<5	170	<5	51
	1/24/02	75	<1,000	<1,000	<1,000	18,000	<1,000	<4,000
	1/24/02	143	<25	<25	<25	860	<25	480
	1/24/02	165.5	<100	<100	<100	1,800	<100	<400
	5/1/02	24	<1	<1	<1	56	2	<200
	5/1/02	75	<100	<100	<100	23,000	330	<20,000
	5/1/02	143	<10	<10	<10	960	12	<2,000
	5/1/02	165.5	<10	<10	<10	1,500	22	<2,000
	7/25/02	24	<1	<1	<1	4	<1	<200
	7/25/02	75	<1	<1	<1	20,000	270	1,400
	7/25/02	143	<1	<1	<1	880	10	<200
	7/25/02	165.5	<1	<1	<1	1,300	18	220
	10/24/02	24	<10	<10	<10	70	<10	<20
	10/24/02	75	<1,250	<1,250	<1,250	23,000	<1,250	2,800
	10/24/02	143	<50	<50	<50	760	<50	120
	10/24/02	165.5	<125	<125	<125	1,400	<125	<250
	1/31/03	24	<1	<1	<1	47	<1	<200
	1/31/03	75	<1	<1	1	28,000	320	2,400
	1/31/03	143	<1	<1	<1	1,100	14	<200
	1/31/03	165.5	<1	<1	<1	1,700	26	<200
	4/23/03	24	<1	<1	<1	460	8	<200
	4/23/03	75	<1	<1	1	27,000	300	3,300
	4/23/03	143	<1	<1	<1	720	11	<200

Table 5. Analytical Results for Ground Water in Multi-Level Wells - Fuel Oxygenates and Lead Scavengers - Redwood Oil Bulk Plant - 455 Yolanda Ave, Santa Rosa, California

Well ID	Sample Date	Sample Depth (in feet)	Lead Scavengers	Diisopropyl Ether	Ethyl-tert-butyl-Ether	MTBE	tert-Amyl Methyl Ether	tert-Butanol
			<---------- ppb ---------->					
MW-21 cont.	4/23/03	165.5	<1	<1	<1	900	14	<200
	7/25/03	24	<1	<1	<1	64	<1	<200
	7/25/03	75	<1	<1	1	25,000	310	5,600
	7/25/03	143	<1	<1	<1	880	12	200
	7/25/03	165.5	<1	<1	<1	910	13	<200
	1/22/04	24	<1	<1	<1	95	2	5
	1/22/04	75	<1	<1	2	28,000	420	4,200
	1/22/04	143	<1	<1	<1	720	12	100
	1/22/04	165.5	<1	<1	<1	870	14	110
	7/19/04	24	<0.5	<0.5	<0.5	200	5.4	38
	7/19/04	75	<5	<5	<5	22,000	350	3,800
	7/19/04	143	<0.5	<0.5	<0.5	980	17	120
	7/19/04	165.5	<0.5	<0.5	<0.5	960	14	130
	1/20/05	24	<1	<0.5	<0.5	920	20	94
	1/20/05	75	<1	0.6	1.2	23,000	300	3,300
	1/20/05	143	<1	<0.5	<0.5	970	15	66
	1/20/05	165.5	<1	<0.5	<0.5	920	16	130
	7/12/05	**24**	**<1**	**<0.5**	**<0.5**	**7.8**	**<0.5**	**<5**
	7/12/05	**75**	**<1**	**0.7**	**1.4**	**41,000**	**450**	**4,900**
	7/12/05	**143**	**<1**	**<0.5**	**<0.5**	**270**	**3.7**	**69**
	7/12/05	**165.5**	**<1**	**<0.5**	**<0.5**	**400**	**5.4**	**88**

Table 5. Analytical Results for Ground Water in Multi-Level Wells - Fuel Oxygenates and Lead Scavengers - Redwood Oil Bulk Plant - 455 Yolanda Ave, Santa Rosa, California

Well ID	Sample Date	Sample Depth (in feet)	Lead Scavengers	Diisopropyl Ether	Ethyl-tert-butyl-Ether	MTBE	tert-Amyl Methyl Ether	tert-Butanol
			<---------- ppb ---------->					
MW-22	2/26/01	22	<100	<100	<100	2,000	<100	830
	2/26/01	47	<25	<25	<25	380	<25	110
	2/26/01	72.5	<25	<25	<25	480	<25	140
	2/26/01	113	<100	<100	<100	2,000	<100	600
	2/26/01	144	<25	<25	<25	720	<25	230
	2/26/01	164.5	<25	<25	<25	630	<25	200
	2/26/01	177.5	<5.0	<5.0	<5.0	59	<5.0	75
	4/27/01	22	---	<2,500	<2,500	86,000	<2,500	18,000
	4/27/01	47	---	<25	<25	1,500	<25	510
	4/27/01	72.5	---	<5.0	<5.0	9.5	<5.0	<20.0
	4/27/01	113	---	<10.0	<10.0	390	11	160
	4/27/01	144	---	<5.0	<5.0	6.2	<5.0	<20.0
	4/27/01	164.5	---	<5.0	<5.0	31	<5.0	36
	4/27/01[1]	177.5	---	---	---	----	---	---
	7/2501	22	<2,500	<2,500	<2,500	92,000	<2,500	16,000
	7/25/01	72.5	<5.0	<5.0	<5.0	160	7.0	<20
	7/25/01	144	<5.0	<5.0	<5.0	71	<5.0	40
	7/25/01	164.5	<5.0	<5.0	<5.0	95	<5.0	53
	10/25/01[2]	22	—	—	—	—	—	---
	10/25/01	72.5	<5	<5	<5	31	<5	<20
	10/25/01	144	<5	<5	<5	45	<5	110
	10/25/01	164.5	<5	<5	<5	28	<5	75
	1/24/02	22	<10,000	<10,000	<10,000	100,000	<10,000	<40,000

Table 5. Analytical Results for Ground Water in Multi-Level Wells - Fuel Oxygenates and Lead Scavengers - Redwood Oil Bulk Plant - 455 Yolanda Ave, Santa Rosa, California

Well ID	Sample Date	Sample Depth (in feet)	Lead Scavengers	Diisopropyl Ether	Ethyl-tert-butyl-Ether	MTBE	tert-Amyl Methyl Ether	tert-Butanol
			<---------- ppb ---------->					
MW-22 cont	1/24/02	72.5	<5	<5	<5	200	5.2	34
	1/24/02	144	<5	<5	<5	150	<5	75
	1/24/02	177.5	<5	<5	<5	160	<5	75
	5/1/02	22	<1,000	<1,000	<1,000	100,000	2,000	<200,000
	5/1/02	72.5	<1	<1	<1	200	8	<200
	5/1/02	144	<1	<1	<1	52	3	<200
	5/1/02	177.5	<1	<1	<1	39	2	<200
	7/25/02	22	2	<1	5	120,000	2,300	6,000
	7/25/02	72.5	<1	<1	<1	290	8	<200
	7/25/02	144	<1	<1	<1	30	1	<200
	7/25/02	177.5	<1	<1	<1	21	<1	<200
	10/24/02[2]	22	---	---	---	---	---	---
	10/24/02	72.5	<25	<25	<25	210	<25	<50
	10/24/02	144	<5	<5	<5	6.2	<5	<10
	10/24/02	177.5	<5	<5	<5	3.1	<5	<10
	1/31/03	22	<1	<1	4	85,000	1,600	5,000
	1/31/03	72.5	<1	<1	<1	2,500	65	<200
	1/31/03	144	<1	<1	<1	1,400	31	<200
	1/31/03	177.5	<1	<1	<1	220	5	<200
	4/23/03	22	<1	<1	3	50,000	1,000	9,100
	4/23/03	72.5	<1	<1	<1	280	11	<200
	4/23/03	144	<1	<1	<1	140	6	<200
	4/23/03	177.5	<1	<1	<1	280	9	<200

Table 5. Analytical Results for Ground Water in Multi-Level Wells - Fuel Oxygenates and Lead Scavengers - Redwood Oil Bulk Plant - 455 Yolanda Ave, Santa Rosa, California

Well ID	Sample Date	Sample Depth (in feet)	Lead Scavengers	Diisopropyl Ether	Ethyl-tert-butyl-Ether	MTBE	tert-Amyl Methyl Ether	tert-Butanol
			<---------- ppb ---------->					
MW-22 cont.	7/24/03	22	<1	<1	3	83,000	1,700	17,000
	7/24/03	72.5	<1	<1	<1	67	3	<200
	7/24/03	144	<1	<1	<1	49	2	<200
	7/24/03	177.5	<1	<1	<1	52	2	<200
	1/22/04	22	2	<1	3	81,000	1,400	9,100
	1/22/04	72.5	<1	<1`	<1	120	5	<5
	1/22/04	144	<1	<1	<1	50	2	<5
	1/22/04	177.5	<1	<1	<1	42	2	<5
	7/19/04	22	<5	<5	<5	49,000	1,700	6,500
	7/19/04	72.5	<0.5	<0.5	<0.5	470	19	<5
	7/19/04	144	<0.5	<0.5	<0.5	31	1.6	<5
	7/19/04	177.5	<0.5	<0.5	<0.5	45	2.2	<5
	1/20/05	22	2.1	<0.5	1.6	51,000	1,200	6,600
	1/20/05	72.5	<1	<0.5	<0.5	480	16	26
	1/20/05	144	<1	<0.5	<0.5	140	5.5	<5
	1/20/05	177.5	<1	<0.5	<0.5	59	2.9	<5
	7/13/05	**22**	**<1**	**<0.5**	**0.8**	**26,000**	**480**	**3,100**
	7/13/05	**72.5**	**<1**	**<0.5**	**<0.5**	**2.9**	**<0.5**	**<5**
	7/13/05	**144**	**<1**	**<0.5**	**<0.5**	**4.0**	**<0.5**	**<5**
	7/13/05	**177.5**	**<1**	**<0.5**	**<0.5**	**77**	**0.8**	**<5**

Table 5. Analytical Results for Ground Water in Multi-Level Wells - Fuel Oxygenates and Lead Scavengers - Redwood Oil Bulk Plant - 455 Yolanda Ave, Santa Rosa, California

Well ID	Sample Date	Sample Depth (in feet)	Lead Scavengers	Diisopropyl Ether	Ethyl-tert-butyl-Ether	MTBE	tert-Amyl Methyl Ether	tert-Butanol
			<---------- ppb ---------->					
MW-23	2/26/01	25	<100	<100	<100	2,100	<100	1,100
	2/26/01	50	<5.0	<5.0	<5.0	150	<5.0	100
	2/26/01	75	<5.0	<5.0	<5.0	92	<5.0	60
	2/26/01	120.5	<10	<10	<10	210	<10	140
	2/26/01	148.5	<5.0	<5.0	<5.0	120	<5.0	81
	2/26/01	163.5	<5.0	<5.0	<5.0	13	<5.0	21
	2/26/01	180	<5.0	<5.0	<5.0	<5.0	<5.0	<20
	4/30/01	25	---	<250	<250	6,300	<250	1,200
	4/30/01	50	---	<5.0	<5.0	49	<5.0	<20
	4/30/01	75	---	<5.0	<5.0	19	<5.0	<20
	4/30/01	120.5	---	<5.0	<5.0	6.4	<5.0	<20
	4/30/01	148.5	---	<5.0	<5.0	22	<5.0	70
	4/30/01	163.5	---	<5.0	<5.0	<5.0	<5.0	<20
	4/30/01	180	---	<5.0	<5.0	48	<5.0	<20
	7/25/01[3]	25	---	—	—	—	—	---
	7/25/01	75	<5.0	<5.0	<5.0	42	<5.0	<20
	7/25/01	148.5	<5.0	<5.0	<5.0	71	<5.0	63
	7/25/01	180	<5.0	<5.0	<5.0	13	<5.0	31
	10/25/01[2]	25	—	—	—	—	—	---
	10/25/01	75	<5	<5	<5	21	<5	74
	10/25/01	148.5	<5	<5	<5	6.5	<5	58
	10/25/01	180	<5	<5	<5	<5	<5	39
	1/24/02	25	<250	<250	<250	4,800	<250	<1,000

Table 5. Analytical Results for Ground Water in Multi-Level Wells - Fuel Oxygenates and Lead Scavengers - Redwood Oil Bulk Plant - 455 Yolanda Ave, Santa Rosa, California

Well ID	Sample Date	Sample Depth (in feet)	Lead Scavengers	Diisopropyl Ether	Ethyl-tert-butyl-Ether	MTBE	tert-Amyl Methyl Ether	tert-Butanol
			<---------- ppb ---------->					
MW-23 cont	1/24/02	75	<5	<5	<5	19	<5	<20
	1/24/02	148.5	<10	<10	<10	92	<10	150
	1/24/02	180	<5	<5	<5	6.3	<5	<20
	5/1/02	25	<10	<10	<10	980	25	<2,000
	5/1/02	75	<1	<1	<1	7	<1	<200
	5/1/02	148.5	<1	<1	<1	17	<1	<200
	5/1/02	180	<1	<1	<1	<1	<1	<200
	7/24/02	25	<1	<1	<1	580	16	<200
	7/24/02	75	<1	<1	<1	13	<1	<200
	7/24/02	148.5	<1	<1	<1	11	<1	<200
	7/24/02	180	<1	<1	<1	<1	<1	<200
	10/24/02[2]	25	---	---	---	---	---	---
	10/24/02	75	<5	<5	<5	21	<5	<10
	10/24/02	148.5	<5	<5	<5	7.9	<5	16
	10/24/02	180	<5	<5	<5	<1	<5	<10
	1/31/03	25	<1	<1	<1	530	14	<200
	1/31/03	75	<1	<1	<1	58	2	<200
	1/31/03	148.5	<1	<1	<1	27	1	<200
	1/31/03	180	<1	<1	<1	4	<1	<200
	4/23/03	25	<1	<1	<1	570	14	<200
	4/23/03	75	<1	<1	<1	28	<1	<200
	4/23/03	148.5	<1	<1	<1	5	<1	<200
	4/23/03	180	<1	<1	<1	<1	<1	<200

Table 5. Analytical Results for Ground Water in Multi-Level Wells - Fuel Oxygenates and Lead Scavengers - Redwood Oil Bulk Plant - 455 Yolanda Ave, Santa Rosa, California

Well ID	Sample Date	Sample Depth (in feet)	Lead Scavengers	Diisopropyl Ether	Ethyl-tert-butyl-Ether	MTBE	tert-Amyl Methyl Ether	tert-Butanol
			<---------- ppb ---------->					
MW-23 cont.	7/24/03	25	<1	<1	<1	200	5	<200
	7/24/03	75	<1	<1	<1	49	<1	<200
	7/24/03	148.5	<1	<1	<1	4	<1	<200
	7/24/03	180	<1	<1	<1	<1	<1	<200
	1/22/04	25	<1	<1	<1	230	5	19
	1/22/04	75	<1	<1	<1	62	<1	<5
	1/22/04	148.5	<1	<1	<1	3	<1	7
	1/22/04	180	<1	<1	<1	<1	<1	8
	7/19/04	25	<0.5	<0.5	<0.5	180	4.8	18
	7/19/04	75	<0.5	<0.5	<0.5	48	0.7	6
	7/19/04	148.5	<0.5	<0.5	<0.5	2.4	<0.5	6
	7/19/04	180	<1	<0.5	<0.5	0.9	<0.5	6
	1/20/05	25	<1	<0.5	<0.5	53	1.4	7
	1/20/05	75	<1	<0.5	<0.5	53	0.7	7
	1/20/05	148.5	<1	<0.5	<0.5	3.2	<0.5	7
	1/20/05	180	<1	<0.5	<0.5	1.2	<0.5	5
	7/13/05	**25**	**<1**	**<0.5**	**<0.5**	**74**	**1.4**	**7.3**
	7/13/05	**75**	**<1**	**<0.5**	**<0.5**	**1.6**	**<0.5**	**<5**
	7/13/05	**148.5**	**<1**	**<0.5**	**<0.5**	**1.6**	**<0.5**	**<5**
	7/13/05	**180**	**<1**	**<0.5**	**<0.5**	**<0.5**	**<0.5**	**<5**
MW-24	2/26/01	23	<5.0	<5.0	<5.0	8.4	<5.0	<20
	2/26/01	48	<5.0	<5.0	<5.0	5.3	<5.0	<20
	2/26/01	73	<5.0	<5.0	<5.0	8.3	<5.0	<20

Table 5. Analytical Results for Ground Water in Multi-Level Wells - Fuel Oxygenates and Lead Scavengers - Redwood Oil Bulk Plant - 455 Yolanda Ave, Santa Rosa, California

Well ID	Sample Date	Sample Depth (in feet)	Lead Scavengers	Diisopropyl Ether	Ethyl-tert-butyl-Ether	MTBE	tert-Amyl Methyl Ether	tert-Butanol
			<---------- ppb ---------->					
MW-24 cont	2/26/01	113	<5.0	<5.0	<5.0	<5.0	<5.0	<20
	2/26/01	146	<5.0	<5.0	<5.0	<5.0	<5.0	<20
	2/26/01	161	<5.0	<5.0	<5.0	<5.0	<5.0	<20
	2/26/01	178	<5.0	<5.0	<5.0	<5.0	<5.0	<20
	5/1/01	23	---	<5.0	<5.0	8.2	<5.0	31.0
	5/1/01	48	---	<5.0	<5.0	<5.0	<5.0	<20.0
	5/1/01	73	---	<5.0	<5.0	<5.0	<5.0	<20.0
	5/1/01	113	---	<5.0	<5.0	<5.0	<5.0	<20.0
	5/1/01	146	---	<5.0	<5.0	<5.0	<5.0	69.0
	5/1/01	161	---	<5.0	<5.0	<5.0	<5.0	50.0
	5/1/01	178	---	<5.0	<5.0	<5.0	<5.0	22.0
	7/25/01	23	<5.0	<5.0	<5.0	58	<5.0	22
	7/25/01	73	<5.0	<5.0	<5.0	6.6	<5.0	<20
	7/25/01	146	<5.0	<5.0	<5.0	18	<5.0	69
	7/25/01	178	<5.0	<5.0	<5.0	8.0	<5.0	52
	10/25/01[2]	23	—	—	—	—	—	---
	10/25/01	73	<5	<5	<5	<5	<5	<20
	10/25/01	146	<5	<5	<5	<5	<5	50
	10/25/01	178	<5	<5	<5	<5	<5	40
	1/25/02	23	<1.5	<2.5	<2.5	82	<0.5	<55
	1/25/02	73	<0.3	<0.5	<0.5	<0.3	<0.1	<11
	1/25/02	146	<0.3	<0.5	<0.5	8.2	<0.1	30
	1/25/02	178	<0.3	<0.5	<0.5	<0.3	<0.1	<11
	4/29/02	23	<1	<1	<1	4	<1	<200

Table 5. Analytical Results fornd Water in Multi-Level Wells - Fuel Oxygenates and Lead Scavengers - Redwood Oil Bulk Plant - 455 Yolanda Ave, Santa Rosa, Cali

Well ID	Sample Date	Sarth (	Lead Scavengers	Diisopropyl Ether	Ethyl-tert-butyl-Ether	MTBE	tert-Amyl Methyl Ether	tert-Butanol
			<---------- ppb ---------->					
MW-24 cont.	4/29/02		<1	<1	<1	<1	<1	<200
	4/29/02		<1	<1	<1	<1	<1	<200
	4/29/02		<1	<1	<1	<1	<1	<200
	7/24/02		<1	<1	<1	5	<1	<200
	7/24/02		<1	<1	<1	<1	<1	<200
	7/24/02		<1	<1	<1	<1	<1	<200
	7/24/02		<1	<1	<1	<1	<1	<200
	10/23/02		<5	<5	<5	6.0	<5	<10
	10/23/02		<5	<5	<5	<1	<5	<10
	10/23/02		<5	<5	<5	13	<5	<10
	10/23/02		<5	<5	<5	<1	<5	<10
	5/25/05		---	<0.5	<0.5	43	<0.5	13
	5/25/05		---	<0.5	<0.5	<0.5	<0.5	<5
	5/25/05		---	<0.5	<0.5	17	<0.5	1
	5/25/05		---	<0.5	<0.5	<0.5	<0.5	<5
MW-25	1/28/02		<1.5	<2.5	<2.5	<1.5	<0.5	<55
	1/28/02		<6	<10	<10	<6	<2	<220
	1/28/02		<6	<10	<10	<6	<2	<220
	1/28/02		<0.3	<0.5	<0.5	<0.3	<0.1	<11
	1/28/02		<6	<10	<10	<6	<2	<220
	4/30/02		<1	<1	<1	<1	<1	<200
	4/30/02		<1	<1	<1	<1	<1	<200
	4/30/02		<1	<1	<1	<1	<1	<200

Table 5. Analytical Results for Ground Water in Multi-Level Wells - Fuel Oxygenates and Lead Scavengers - Redwood Oil Bulk Plant - 455 Yolanda Ave, Santa Rosa, California

Well ID	Sample Date	Sample Depth (in feet)	Lead Scavengers	Diisopropyl Ether	Ethyl-tert-butyl-Ether	MTBE	tert-Amyl Methyl Ether	tert-Butanol
			<---------- ppb ---------->					
MW-25 cont.	4/30/02	180	<1	<1	<1	<1	<1	<200
	4/30/02	230	<1	<1	<1	<1	<1	<200
	7/26/02	25	<1	<1	<1	2	<1	<200
	7/26/02	75	<1	<1	<1	<1	<1	<200
	7/26/02	145	<1	<1	<1	<1	<1	<200
	7/26/02	180	<1	<1	<1	<1	<1	<200
	7/26/02	230	<1	<1	<1	<1	<1	<0.5
	5/26/05	25	---	<0.5	<0.5	<0.5	<0.5	<5
	5/26/05	75	---	<0.5	<0.5	<0.5	<0.5	<5
	5/26/05	145	---	0.6	<0.5	<0.5	<0.5	19
	5/26/05	180	---	1	<0.5	<0.5	<0.5	20
	5/26/05	230	---	0.9	<0.5	<0.5	<0.5	17
MW-26	1/25/02	25	<60	<100	<100	<60	<20	<2,200
	1/25/02	75	<0.3	<0.5	<0.5	<0.3	<0.1	<11
	1/25/02	145	<0.3	<0.5	<0.5	<0.3	<0.1	<11
	1/25/02	180	<0.3	<0.5	<0.5	<0.3	<0.1	<11
	5/2/02	25	<1	<1	<1	4	<1	<200
	5/2/02	75	<1	<1	<1	<1	<1	<200
	5/2/02	145	<1	<1	<1	1	<1	<200
	5/2/02	180	<1	<1	<1	1	<1	<200
	7/26/02[2]	25	---	---	---	---	---	---
	7/26/02	75	<1	<1	<1	<1	<1	<200
	7/26/02	145	<1	<1	<1	<1	<1	<200

Table 5. Analytical Reor Ground Water in Multi-Level Wells - Fuel Oxygenates and Lead Scavengers - Redwood Oil Bulk Plant - 455 Yolanda Ave, Santa Rolifornia

Well ID	Sample Date	Sample Depth (in feet)	Lead Scavengers	Diisopropyl Ether	Ethyl-tert-butyl-Ether	MTBE	tert-Amyl Methyl Ether	tert-Butanol
			<---------- ppb ---------->					
MW-26 cont.	7/26/02	180	<1	<1	<1	<1	<1	<200
	4/23/03	25	<1	<1	<1	<1	<1	<200
	4/23/03	75	<1	<1	<1	<1	<1	<200
	4/23/03	145	<1	<1	<1	<1	<1	<200
	4/23/03	180	<1	<1	<1	<1	<1	<200
	1/21/04	25	<1	<1	<1	<1	<1	<5
	1/21/04	75	<1	<1	<1	<1	<1	11
	1/20/05	25	<1	<0.5	<0.5	<0.5	<0.5	<5
	1/20/05	75	<1	<0.5	<0.5	<0.5	<0.5	8
MW-27	1/28/02	25	<6	<10	<10	<6	<2	<220
	1/28/02	75	<1.5	<2.5	<2.5	2.3	<0.5	<55
	1/28/02	145	<6	<10	<10	<6	<2	<220
	1/28/02	180	<1.5	<2.5	<2.5	<1.5	<0.5	<55
	1/28/02	230	<0.6	<1	<1	1.5	<0.2	<22
	4/30/02	25	<1	<1	<1	<1	<1	<200
	4/30/02	75	<1	<1	<1	<1	<1	<200
	4/30/02	145	<1	<1	<1	<1	<1	<200
	4/30/02	180	<1	<1	<1	<1	<1	<200
	4/30/02	230	<1	<1	<1	<1	<1	<200
	7/26/02	25	<1	<1	<1	6	<1	<200
	7/26/02	75	<1	<1	<1	10	<1	<200
	7/26/02	145	<1	<1	<1	<1	<1	<200
	7/26/02	180	<1	<1	<1	<1	<1	<200

Table 5. Analytical Results for Ground Water in Multi-Level Wells - Fuel Oxygenates and Lead Scavengers - Redwood Oil Bulk Plant - 455 Yolanda Ave, Santa Rosa, California

Well ID	Sample Date	Sample Depth (in feet)	Lead Scavengers	Diisopropyl Ether	Ethyl-tert-butyl-Ether	MTBE	tert-Amyl Methyl Ether	tert-Butanol
			<---------- ppb ---------->					
MW-27 cont.	7/26/02	230	<1	<1	<1	6	<1	<200
	10/23/02	25	<5	<5	<5	<1	<5	<10
	10/23/02	75	<500	<500	<500	<100	<500	<1,000
	10/23/02	145	<5	<5	<5	<1	<5	<10
	10/23/02	180	<5	<5	<5	<1	<5	<10
	10/23/02	230	<5	<5	<5	<1	<5	26
	5/26/05	25	---	<0.5	<0.5	<0.5	<0.5	<5
	5/26/05	75	---	<0.5	<0.5	<0.5	<0.5	24
	5/26/05	145	---	<0.5	<0.5	<0.5	<0.5	<5
	5/26/05	180	---	<0.5	<0.5	<0.5	<0.5	<5
	5/26/05	230	---	0.7	<0.5	<0.5	<0.5	30
MW-28	1/25/02	25	<30	<50	<50	35	<10	<1,100
	1/25/02	75	<0.3	<0.5	<0.5	<0.3	<0.1	<11
	1/25/02	145	<0.3	<0.5	<0.5	<0.3	<0.1	<11
	1/25/02	180	<0.6	<1	<1	0.6	<0.2	<22
	5/2/02	25	<1	<1	<1	4	<1	<200
	5/2/02	75	<1	<1	<1	2	<1	<200
	5/2/02	145	<1	<1	<1	2	<1	<200
	5/2/02	180	<1	<1	<1	<1	<1	<200
	7/26/02[3]	25	—	—	—	—	—	---
	7/26/02	75	<1	<1	<1	<1	<1	<200
	7/26/02	145	<1	<1	<1	<1	<1	<200
	7/26/02	180	<1	<1	<1	<1	<1	<200

Table 5. Analytesults for Ground Water in Multi-Level Wells - Fuel Oxygenates and Lead Scavengers - Redwood Oil Bulk Plant - 455 Yolanda Ave, Rosa, California

Well ID		Sample Depth (in feet)	Lead Scavengers	Diisopropyl Ether	Ethyl-tert-butyl-Ether	MTBE	tert-Amyl Methyl Ether	tert-Butanol
			<---------- ppb ---------->					
MW-28 cont.		25	<1	<1	<1	12	<1	<200
		75	<1	<1	<1	4	<1	<200
		145	<1	<1	<1	2	<1	<200
		180	<1	<1	<1	1	<1	<200
		25	<1	<1	<1	<1	<1	<200
		75	<1	<1	<1	<1	<1	<200
		145	<1	<1	<1	<1	<1	<200
		180	<1	<1	<1	<1	<1	<200
		25	<1	<1	<1	<1	<1	6
		75	<1	<1	<1	<1	<1	8
		25	<1	<0.5	<0.5	<0.5	<0.5	<5
		75	<1	<0.5	<0.5	<0.5	<0.5	6
MW-29		25	<6	<10	<10	13	<2	<220
		75	<6	<10	<10	6.0	<2	<220
		145	<6	<10	<10	<6	<2	<220
		180	<6	<10	<10	<6	<2	<220
		25	<1	<1	<1	<1	<1	<200
		75	<1	<1	<1	<1	<1	<200
		145	<1	<1	<1	<1	<1	<200
		180	<1	<1	<1	<1	<1	<200
		25	<1	<1	<1	3	<1	<200
		75	<1	<1	<1	<1	<1	<200
		145	<1	<1	<1	<1	<1	<200

Table 5. Analytical Results for Ground Water in Multi-Level Wells - Fuel Oxygenates and Lead Scavengers - Redwood Oil Bulk Plant - 455 Yolanda Ave, Santa Rosa, California

Well ID	Sample Date	Sample Depth (in feet)	Lead Scavengers	Diisopropyl Ether	Ethyl-tert-butyl-Ether	MTBE	tert-Amyl Methyl Ether	tert-Butanol
			<---------- ppb ---------->					
MW-29 cont.	7/24/02	180	<1	<1	<1	<1	<1	<200
	1/31/03	25	<1	<1	<1	50	2	<200
	1/31/03	75	<1	<1	<1	16	<1	<200
	1/31/03	145	---	---	---	---	---	---
	1/31/03	180	---	---	---	---	---	---
	1/21/04	25	<1	<1	<1	2	<1	9
	1/21/04	75	<1	<1	<1	<1	<1	24
	1/19/05	25	<1	<0.5	<0.5	0.6	<0.5	6
	1/19/05	75	<1	<0.5	<0.5	<0.5	<0.5	12
	5/25/05	23	---	<0.5	<0.5	<0.5	<0.5	11
	5/25/05	73	---	<0.5	<0.5	<0.5	<0.5	8
	5/25/05	145	---	<0.5	<0.5	<0.5	<0.5	9
	5/25/05	180	---	<0.5	<0.5	<0.5	<0.5	8
MW-30	1/28/02	25	<3	<5	<5	170	<1	<110
	1/28/02	75	<6	<10	<10	12	<2	<220
	1/28/02	145	<1.5	<2.5	<2.5	1.6	<0.5	<55
	1/28/02	180	<3	<5	<5	<3	<1	<110
	1/28/02	230	<1.5	<2.5	<2.5	<1.5	<0.5	<55
	4/29/02	25	<1	<1	<1	130	<1	<200
	4/29/02	75	<1	<1	<1	2	<1	<200
	4/29/02	145	<1	<1	<1	<1	<1	<200
	4/29/02	180	<1	<1	<1	<1	<1	<200
	4/29/02	230	<1	<1	<1	<1	<1	<200

Table 5. Analytical Results for Ground Water in Multvel Wells - Fuel Oxygenates and Lead Scavengers - Redwood Oil Bulk Plant - 455 Yolanda Ave, Santa Rosa, California

Well ID	Sample Date	Sample Depth (in feet)	Lead Scavengers)iisopropyl Ether		Ethyl-tert-butyl-Ether	MTBE	tert-Amyl Methyl Ether	tert-Butanol
			<---------- ppb ---------->					
MW-30 cont.	7/24/02	25	<1	<1	<1	150	<1	<200
	7/24/02	75	<1	1	<1	1	<1	<200
	7/24/02	145	<1	<1	<1	<1	<1	<200
	7/24/02	180	<1	<1	<1	<1	<1	<200
	7/24/02	230	<1	<1	<1	<1	<1	<200
	1/31/03	25	<1	<1	<1	220	2	<200
	1/31/03	75	<1	2	<1	8	<1	<200
	1/31/03	145	<1	1	<1	21	1	<200
	1/31/03	180	<1	<1	<1	6	<1	<200
	1/31/03	230	<1	<1	<1	7	<1	<200
	7/23/03[2]	25	---	---	---	---	---	---
	7/23/03	75	<1	1	<1	3	<1	<200
	7/23/03	145	<1	<1	<1	1	<1	<200
	7/23/03	180	<1	<1	<1	<1	<1	<200
	7/23/03	230	<1	<1	<1	<1	<1	<200
	1/21/04	25	<1	<1	<1	200	1	<5
	1/21/04	75	<1	2	<1	4	<1	<5
	1/19/05	25	<1	<0.5	<0.5	170	1.1	<5
	1/19/05	75	0.7	2.2	<0.5	6.0	<0.5	<5

Table 5. Analytical Results for Ground Water in Multi-Level Wells - Fuel Oxygenates and Lead Scavengers - Redwood Oil Bulk Plant - 455 Yolanda Ave, Santa Rosa, California

Explanation:

MTBE = Methyl tertiary-butyl ether
ppb = parts per billion

Notes:

[1] Port was inaccessible.

[2] Port was dry, therefore not sampled.

ECMQMs\507\50714TGW.T5mlw

Table 6. Analytical Results for Ground Water in Multi-Level Wells - Organic Compounds - Redwood Oil Bulk Plant - 455 Yolanda Ave, Santa Rosa, California

Sample ID	Sample Date	Sample Depth (in feet)	TPPH(G)	TPH(D)	Motor Oil	Benzene	Toluene	Ethylbenzene	Xylenes
			< ppb >						
MW-21	10/24/02	24	130	220	320	3.0	0.65	<0.5	10
	10/24/02	75	13,000	620	720	<100	<100	<100	<200
	10/24/02	143	750	210	<250	36	15	7.6	31
	10/24/02	165.5	1,100	200	<250	17	9.2	<5	17
	1/31/03	24	54	410	<250	13	2	1	10
	1/31/03	75	790	780	430	180	69	44	175
	1/31/03	143	730	210	<250	210	74	46	184
	1/31/03	165.5	310	230	<250	77	34	19	71
	4/23/03	24	92	370	<250	16	2	1	9
	4/23/03	75	1,400	640	310	250	72	52	210
	4/23/03	143	420	220	<250	88	31	21	88
	4/23/03	165.5	210	190	<250	37	14	8	37
	7/25/03	24	84	330	<250	21	2	2	12
	7/25/03	75	740	550	<250	110	38	27	105
	7/25/03	143	210	90	<250	41	16	11	43
	7/25/03	165.5	110	140	<250	19	8	6	22
	1/22/04	24	65	370	370	18	<1	1	4
	1/22/04	75	1,400	650	330	150	48	37	140
	1/22/04	143	230	190	<250	38	15	12	47
	1/22/04	165.5	130	110	<250	18	8	7	28
	7/19/04	24	150	270	<250	36	3.5	2.5	10
	7/19/04	75	1,900	770	300	330	85	80	260
	7/19/04	143	610	310	<250	89	32	27	100
	7/19/04	165.5	190	62	<250	20	8.7	7.9	29

Table 6. Analytical Results for Ground Water in Multi-Level Wells - Organic Compounds - Redwood Oil Bulk Plant - 455 Yolanda Ave, Santa Rosa, California

Sample ID	Sample Date	Sample Depth (in feet)	TPPH(G)	TPH(D)	Motor Oil	Benzene	Toluene	Ethylbenzene	Xylenes
			< ---------- ppb ---------- >						
MW-21 cont.	1/20/05	24	250	470	<1,250	30	2.6	3.5	8.6
	1/20/05	75	1,200	950	<250	150	42	51	147
	1/20/05	143	660	260	<250	69	27	25	95
	1/20/05	165.5	190	160	<250	25	10	10	33
	7/12/05	**24**	**<100**	**<50**	**<250**	**<0.5**	**<0.5**	**<0.5**	**<1.5**
	7/12/05	**75**	**720**	**110**	**<250**	**8.7**	**3.1**	**4.4**	**12.4**
	7/12/05	**143**	**120**	**79**	**<250**	**8.8**	**4.6**	**4.9**	**19.2**
	7/12/05	**165.5**	**110**	**<50**	**<250**	**5.0**	**2.8**	**3.0**	**10.2**
MW-22	10/24/02[1]	22	—	—	—	—	—	—	—
	10/24/02	72.5	140	160	290	<1.25	<1.25	<1.25	<2.5
	10/24/02	144	<50	330	380	<0.5	<0.5	<0.5	<1
	10/24/02	177.5	<50	100	<250	<0.5	<0.5	<0.5	<1
	1/31/03	22	600	2,000	720	1	<1	<1	<1
	1/31/03	72.5	<50	120	<250	1	<1	<1	<1
	1/31/03	144	<50	120	<250	<1	<1	<1	<1
	1/31/03	177.5	<50	98	<250	<1	<1	<1	<1
	4/23/03	22	810	2,100	510	<1	<1	<1	<1
	4/23/03	72.5	<50	<50	<250	<1	<1	<1	<1
	4/23/03	144	<50	110	<250	<1	<1	<1	<1
	4/23/03	177.5	<50	93	<250	<1	<1	<1	<1
	7/24/03	22	1,400	1,300	420	<1	<1	<1	<1
	7/24/03	72.5	<50	<50	<250	<1	<1	<1	<1
	7/24/03	144	<50	<50	<250	<1	<1	<1	<1

Table 6. Analytical Results for Ground Water in Multi-Level Wells - Organic Compounds - Redwood Oil Bulk Plant - 455 Yolanda Ave, Santa Rosa, California

Sample ID	Sample Date	Sample Depth (in feet)	TPPH(G)	TPH(D)	Motor Oil	Benzene	Toluene	Ethylbenzene	Xylenes
			< ppb >						
MW-22 cont.	7/24/03	177.5	<50	<50	<250	<1	<1	<1	<1
	1/22/04	22	890	590	<250	<1	<1	<1	<1
	1/22/04	72.5	<50	<50	<250	<1	<1	<1	<1
	1/22/04	144	<50	<50	<250	<1	<1	<1	<1
	1/22/04	177.5	<50	72	<250	<1	<1	<1	<1
	7/19/04	22	1,500	370	<250	<5	<5	<5	<15
	7/19/04	72.5	<50	<50	<250	<0.5	<0.5	<0.5	<1.5
	7/19/04	144	<50	<50	<250	<0.5	<0.5	<0.5	<1.5
	7/19/04	177.5	<50	57	<250	<0.5	<0.5	<0.5	<1.5
	1/20/05	22	760	1,100	<250	<0.5	<0.5	<0.5	<1.5
	1/20/05	72.5	<50	<50	<250	<0.5	<0.5	<0.5	<1.5
	1/20/05	144	<50	57	<250	<0.5	<0.5	<0.5	<1.5
	1/20/05	177.5	<50	<50	<250	<0.5	<0.5	<0.5	<1.5
	7/13/05	**22**	**1,100**	**<50**	**<250**	**<0.5**	**<0.5**	**<0.5**	**<1.5**
	7/13/05	**72.5**	**<100**	**<50**	**<250**	**<0.5**	**<0.5**	**<0.5**	**<1.5**
	7/13/05	**144**	**<100**	**<50**	**<250**	**<0.5**	**<0.5**	**<0.5**	**<1.5**
	7/13/05	**177.5**	**<100**	**<50**	**<250**	**<0.5**	**<0.5**	**<0.5**	**<1.5**
MW-23	10/24/02[1]	25	—	—	—	—	—	—	—
	10/24/02	75	<50	250	310	<0.5	<0.5	<0.5	<1
	10/24/02	148.5	<50	350	490	<0.5	<0.5	<0.5	<1
	10/24/02	180	<50	130	<250	<0.5	<0.5	<0.5	<1
	1/31/03	25	<50	<50	<250	<1	<1	<1	<1
	1/31/03	75	<50	93	<250	<1	<1	<1	<1

Table 6. Analytical Results for Ground Water in Multi-Level Wells - Organic Compounds - Redwood Oil Bulk Plant - 455 Yolanda Ave, Santa Rosa, California

Sample ID	Sample Date	Sample Depth (in feet)	TPPH(G)	TPH(D)	Motor Oil	Benzene	Toluene	Ethylbenzene	Xylenes
			< ppb >						
MW-23 cont	1/31/03	148.5	<50	540	440	<1	<1	<1	<1
	1/31/03	180	<50	200	<250	<1	<1	<1	<1
	4/23/03	25	<50	140	310	<1	<1	<1	<1
	4/23/03	75	<50	<50	<250	<1	<1	<1	<1
	4/23/03	148.5	<50	450	360	<1	<1	<1	<1
	4/23/03	180	<50	130	<250	<1	<1	<1	<1
	7/24/03	25	<50	54	<250	<1	<1	<1	<1
	7/24/03	75	<50	<50	<250	<1	<1	<1	<1
	7/24/03	148.5	<50	270	<250	<1	<1	<1	<1
	7/24/03	180	<50	57	<250	<1	<1	<1	<1
	1/22/04	25	<50	110	<250	<1	<1	<1	<1
	1/22/04	75	<50	<50	<250	<1	<1	<1	<1
	1/22/04	148.5	<50	450	370	<1	<1	<1	<1
	1/22/04	180	<50	58	<250	<1	<1	<1	<1
	7/19/04	25	<50	70	<250	<0.5	<0.5	<0.5	<1.5
	7/19/04	75	<50	57	<250	<0.5	<0.5	<0.5	<1.5
	7/19/04	148.5	<50	190	<250	<0.5	<0.5	<0.5	<1.5
	7/19/04	180	<50	<50	<250	<0.5	<0.5	<0.5	<1.5
	1/20/05	25	<50	70	<250	<0.5	<0.5	<0.5	<1.5
	1/20/05	75	<50	240	<250	<0.5	<0.5	<0.5	<1.5
	1/20/05	148.5	<50	410	<250	<0.5	<0.5	<0.5	<1.5
	1/20/05	180	<50	250	<250	<0.5	<0.5	<0.5	<1.5
	7/13/05	**25**	**<100**	**59**	**<250**	**<0.5**	**<0.5**	**<0.5**	**<1.5**
	7/13/05	**75**	**<100**	**<50**	**<250**	**<0.5**	**<0.5**	**<0.5**	**<1.5**

Table 6. Analytical Results for Ground Water in Multi-Level Wells - Organic Compounds - Redwood Oil Bulk Plant - 455 Yolanda Ave, Santa Rosa, California

Sample ID	Sample Date	Sample Depth (in feet)	TPPH(G)	TPH(D)	Motor Oil	Benzene	Toluene	Ethylbenzene	Xylenes
			< ppb >						
MW-23 cont	7/13/05	148.5	<100	<50	<250	<0.5	<0.5	<0.5	<1.5
	7/13/05	180	<100	<50	<250	<0.5	<0.5	<0.5	<1.5
MW-24	5/25/05	25	<100	<50	---	<0.5	<0.5	<0.5	<1.5
	5/25/05	73	<100	<50	---	<0.5	<0.5	<0.5	<1.5
	5/25/05	146	<100	<50	---	<0.5	<0.5	<0.5	<1.5
	5/25/05	178	<100	<50	---	<0.5	<0.5	<0.5	<1.5
MW-25	5/26/05	25	<100	<50	---	<0.5	<0.5	<0.5	<1.5
	5/26/05	75	<100	<50	---	<0.5	<0.5	<0.5	<1.5
	5/26/05	145	<100	<50	---	<0.5	2.9	<0.5	<1.5
	5/26/05	180	100	<50	---	<0.5	19	2.7	11.2
	5/26/05	230	100	<250[2]	---	<0.5	15	3.7	15.1
MW-27	5/26/05	25	<100	<50	---	<0.5	<0.5	<0.5	<1.5
	5/26/05	75	<100	<50	---	<0.5	0.7	<0.5	<1.5
	5/26/05	145	<100	<250[2]	---	<0.5	0.9	0.6	1.7
	5/26/05	180	<100	<50	---	<0.5	3	2.3	5.1
	5/26/05	230	<100	<50	---	<0.5	5.2	<0.5	<1.5
MW-29	5/25/05	23	<100	<50	---	<0.5	4.9	0.7	2.5
	5/25/05	73	<100	<50	---	<0.5	0.8[1]	<0.5	<1.5
	5/25/05	145	<100	<50	---	<0.5	3.1	2.4	10.2
	5/25/05	180	<100	<50	---	<0.5	<0.5	<0.5	<1.5

Table 6. Analytical Results for Ground Water in Multi-Level Wells - Organic Compounds - Redwood Oil Bulk Plant - 455 Yolanda Ave, Santa Rosa, California

Explanation:

TPPH(G) = Total Purgeable Petroleum Hydrocarbons as Gasoline
TPH(D) = Total Petroleum Hydrocarbons as Diesel
ppb = parts per billion

Notes:

[1] Port was dry.
[2] The sample was diluted.
[3] The calibration results for this range fell outside of acceptance criteria. The value reported is an estimate.

C1:\507-14GWT6mlw

Table 7. Analytical Results for Soil - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California

Sample ID	Sample Date	Sample Depth (in feet)	TPH-G	TPH-D	TPH-MO	Benzene	Toluene	Ethyl-Benzene	Xylenes	MTBE	Total Lead	HVOCs/ VOCs
			<---------- PPM ---------->									
MW-1	11/26/90	9 -11	36	350	---	0.042	0.096	0.036	0.160	---	---	---
MW-2	11/26/90	14-15	2,800	1,000	---	19	75	32	190	---	---	ND[1]
MW-3	11/27/90	19-21	1,300	560	---	10	36	13	70	---	---	ND[1]
MW-4	11/27/90	9 - 11	<1	<1	---	<0.0025	<0.0025	<0.0025	<0.0025	---	---	---
	11/27/90	14 - 15	<1	<1	---	<0.0025	<0.0025	<0.0025	<0.0025	---	---	---
MW-5	6/5/91	6	<1	<1	---	<0.0025	<0.0025	<0.0025	<0.0025	---	---	ND[1]
	6/5/91	15.5	<1	<1	---	<0.0025	<0.0025	<0.0025	<0.0025	---	---	ND[1]
	6/5/91	21	<1	<1	---	<0.0025	<0.0025	<0.0025	<0.0025	---	---	ND[1]
	6/5/91	36	<1	<1	---	<0.0025	<0.0025	<0.0025	<0.0025	---	---	ND[1]
	6/6/91	44	<1	<1	---	<0.0025	<0.0025	<0.0025	<0.0025	---	---	ND[1]
MW-7	6/7/91	6	<1	<1	---	<0.0025	<0.0025	<0.0025	<0.0025	---	---	ND[1]
	6/7/91	16	140	290	---	<0.025	<0.025	<0.025	0.55	---	---	ND[1]
	6/7/91	21	1.1	<1	---	<0.0025	<0.0025	<0.0025	<0.0025	---	---	ND[1]
	6/7/91	48.5	<1	<1	---	<0.0025	<0.0025	<0.0025	<0.0025	---	---	ND[1]
MW-8	6/3/91	11	<1	<1	---	<0.0025	<0.0025	<0.0025	<0.0025	---	---	---
	6/3/91	29.5	<1	<1	---	<0.0025	<0.0025	<0.0025	<0.0025	---	---	---
	6/4/91	50.5	<1	<1	---	<0.0025	<0.0025	<0.0025	<0.0025	---	---	---
V-1	6/3/91	6	<1	<1	---	<0.0025	<0.0035	<0.0025	<0.0025	---	---	ND[1]
	6/3/91	11	1,700	950	---	2.1	27	26	120	---	---	ND[4]

Table 7. Analytical Results for Soil - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California

Sample ID	Sample Date	Sample Depth (in feet)	TPH-G	TPH-D	TPH-MO	Benzene	Toluene	Ethyl-Benzene	Xylenes	MTBE	Total Lead	HVOCs/ VOCs
			<---------- PPM ---------->									
	6/3/91	21	190	150	---	0.42	0.24	1.3	6.8	---	---	ND[1]
V-1 cont.	6/3/91	26	<1	<1	---	0.057	0.013	0.0003	0.019	---	---	ND[1]
V-2	6/6/91	6	<1	<1	---	0.012	<0.0025	<0.0025	<0.0025	---	---	---
	6/6/91	13.5	410	---	---	<0.0025	<0.0025	1.6	1.4	---	---	---
	6/6/91	16	230	330	---	0.63	<0.125	1.8	1.6	---	---	---
	6/6/91	22.5	81	450	---	0.0078	<0.05	0.055	0.15	---	---	---
G-1	10/16/96	10.5 - 11.0	<1	<1	---	<0.005	<0.005	<0.005	<0.005	---	---	--
G-2	10/16/96	6.0-6.5	<1	<1	---	<0.005	<0.005	<0.005	<0.005	---	---	ND[1]
G-3	10/14/96	10.5-11.0	<1	<1	---	<0.005	<0.005	<0.005	<0.005	---	---	--
G-4	10/15/96	20.5-21.0	<1	<1	---	<0.005	<0.005	<0.005	<0.005	---	---	--
G-6/MW-10	10/15/96	10.5-11.0	<1	<1	---	<0.005	<0.005	<0.005	<0.005	---	---	--
G-7	10/15/96	5.526.0-26.5	<1	<1	---	<0.005	<0.005	<0.005	<0.005	---	---	--
G-8	10/1/96	21.0-21.5	<1	<1	---	<0.005	<0.005	<0.005	<0.005	---	---	--
G-9	10/16/96	16.0 - 16.5	<1	<1	---	<0.005	<0.005	<0.005	<0.005	---	---	--
G-10	10/16/96	16.0-16.5	<1	6	---	<0.005	<0.005	<0.005	<0.005	---	---	ND[1]
MW-9	10/14/96	16.0-16.5	<1	<1	---	<0.005	<0.005	<0.005	<0.005	---	---	--
G-11	4/14/98	10.5 - 11.0	<1	<1	---	<0.005	<0.005	<0.005	<0.005	ND	---	--

Table 7. Analytical Results for Soil - Wood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California

Sample ID	Sample Date	Sample Depth (in feet)	TPH-G	TPH-D	TPH-MO	Benzene	Toluene	Ethyl-Benzene	Xylenes	MTBE	Total Lead	HVOCs/ VOCs
			<---------- PPM ---------->									
G-12	4/14/98	10.5 - 11.0	<1	<1	---	<0.005	<0.005	<0.005	<0.005	ND	---	--
G-13	4/14/98	10.5 - 11.0	<1	<1	---	<0.005	<0.005	<0.005	<0.005	ND	---	--
G-14	4/15/98	15.5 - 16.0	<1	<1	---	<0.005	<0.005	<0.005	<0.005	ND	---	--
G-15	4/15/98	15.5 - 16.0	<1	<1	---	<0.005	<0.005	<0.005	<0.005	ND	---	--
G-16	4/15/98	10.5 - 11.0	<1	<1	---	<0.005	<0.005	<0.005	<0.005	ND	---	--
G-17	4/15/98	10.5 11.0	<1	<1	---	<0.005	<0.005	<0.005	<0.005	ND	---	--
MW-11	4/27/00	21'	<1	<1	---	<0.005	<0.005	<0.005	<0.005	<0.005	---	---
MW-12	4/25/00	16'	<1	<1	---	<0.005	<0.005	<0.005	<0.005	<0.005	---	---
MW-12	4/25/00	21'	<1	<1	---	<0.005	<0.005	<0.005	<0.005	<0.005	---	---
MW-13	4/25/00	16'	<1	<1	---	<0.005	<0.005	<0.005	<0.005	<0.005	---	---
MW-13	4/25/00	21'	<1	<1	---	<0.005	<0.005	<0.005	<0.005	<0.005	---	---
MW-14	4/25/00	16.5	<1	<1	---	<0.005	<0.005	<0.005	<0.005	<0.005	---	---
MW-14	4/25/00	21.5	<1	<1	---	<0.005	<0.005	<0.005	<0.005	<0.005	---	---
MW-15	4/26/00	10'	<1	<1	---	<0.005	<0.005	<0.005	<0.005	<0.005	---	---
MW-16	4/26/00	11'	<1	<1	---	<0.005	<0.005	<0.005	<0.005	<0.005	---	---
MW-17	4/26/00	11'	<1	<1	---	<0.005	<0.005	<0.005	<0.005	<0.005	---	---
MW-18	4/27/00	11'	<1	<1	---	<0.005	<0.005	<0.005	<0.005	<0.005	---	---

Table 7. Analytical Results for Soil - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California

Sample ID	Sample Date	Sample Depth (in feet)	TPH-G	TPH-D	TPH-MO	Benzene	Toluene	Ethyl-Benzene	Xylenes	MTBE	Total Lead	HVOCs/ VOCs
			<---------- PPM ---------->									
MW-19	4/27/00	11'	<1	<1	---	<0.005	<0.005	<0.005	<0.005	<0.005	---	---
MW-20	5/26/00	10.5'	<1	<1	---	<0.005	<0.005	<0.005	<0.005	<0.005	---	---
B-1	7/27/00	15	3,000	2,000	---	7.3	<5.0	46	85	7.4	3.4	---
B-2	7/27/00	15	1,100	1,500	---	0.39	<0.2	3.8	5.4	7.2	2.7	---
B-3	7/27/00	15	8.2	5.9	---	<0.005	<0.005	0.02	0.01	1.8	2.4	---
B-4	7/28/00	15	570	1,600	---	3.5	<0.5	1.2	3.4	6.8	2.5	---
B-5	7/28/00	15	1,200	1,100	---	6.6	7.7	17	56	3.8	2.9	---
SW-1	7/27/00	12	<25	<1.0	---	<0.1	<0.1	<0.1	<0.1	0.47	2.9	---
SW-2	7/27/00	12	<25	<1.0	---	<0.1	<0.1	<0.1	<0.1	0.41	2.7	---
SW-3	7/27/00	12	<5.0	<1.0	---	<0.02	<0.02	<0.02	<0.02	0.50	2.6	---
SW-4	7/27/00	12	<25	<1.0	---	<0.1	<0.1	<0.1	<0.1	0.41	3.2	---
SW-5	7/27/00	12	<5.0	<1.0	---	<0.02	<0.02	<0.02	<0.02	0.98	3.8	---
SW-6	7/27/00	12	120	67	---	<0.2	<0.2	0.44	2.0	0.49	5.0	---
SW-7	7/27/00	10	<50	5.3	---	<0.2	<0.2	<0.2	<0.2	1.0	3.9	---
SW-8	7/27/00	10	2,600	5,500	---	21	4.5	43	100	2.1	3.9	---
P-1	8/2/00	3	2.3	12	---	0.01	<0.005	0.02	0.008	0.02	7.8	---
P-2	8/2/00	3	10	62	---	0.47	0.02	0.02	0.05	0.19	14	---
P-3	8/2/00	3	1.1	370	---	<0.005	<0.005	<0.005	0.005	0.008	17	---
P-4	8/2/00	3	47	140	---	0.34	<0.13	<0.13	0.47	0.27	7.9	---

Table 7. Analytical Results fl - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California

Sample ID	Sample Date	Sample Depth (in feet)	H-G	TPH-D	TPH-MO	Benzene	Toluene	Ethyl-Benzene	Xylenes	MTBE	Total Lead	HVOCs/ VOCs
		<---------- PPM ---------->										
P-5	8/2/00	3	7.2	42	---	0.10	0.01	0.04	0.04	0.05	8.6	---
P-6	8/2/00	3	5.9	120	---	0.07	<0.005	0.07	0.04	0.08	9.1	---
D-1	8/2/00	3	110	98	---	0.53	0.13	1.2	0.44	0.27	8.8	---
D-2	8/2/00	3	180	980	---	0.52	<0.13	0.43	0.91	0.36	8.0	---
GP1	1/10/00	10	8.7	<1.0	---	0.007	0.005	0.007	0.008	8.9	---	---
GP1	1/10/00	14	200	280	---	<0.5	1.0	3.0	9.3	3.0	---	---
GP2 @ 11'	1/10/00	11	760	<1.0	---	<0.5	2.3	9.7	46	1.7	---	---
GP2 @ 14'	1/10/00	14	310	<1.0	---	<0.5	3.3	3.6	21	1.8	---	---
GP3 @ 11'	1/10/00	11	<1.0	<1.0	---	<0.005	<0.005	<0.005	<0.005	1.1	---	---
GP3 @ 14'	1/10/00	14	100	290	---	<0.5	2.1	<0.5	1.4	3.2	---	---
GP4 @ 9'	1/10/00	9	<1.0	<1.0	---	<0.005	<0.005	<0.005	<0.005	0.83	---	---
GP4 @ 13'	1/10/00	13	160	<1.0	---	<0.13	2.0	2.2	2.1	4.3	---	---
GP5 @ 10'	1/10/00	10	<1.0	<1.0	---	<0.005	<0.005	<0.005	<0.005	0.54	---	---
GP-5 @ 13'	1/10/00	13	<0.1	<1.0	---	<0.005	<0.005	<0.005	<0.005	0.95	---	---
GP6 @ 9'	1/10/00	9	<1.0	<1.0	---	<0.005	<0.005	<0.005	<0.005	0.21	---	---
GP6 @ 13'	1/10/00	13	100	150	---	<0.5	2.1	<0.5	0.77	0.87	---	---
GP7 @ 9'	1/10/00	9	<1.0	<1.0	---	<0.005	<0.005	<0.005	<0.005	9.1	---	---
GP7 @ 13'	1/10/00	13	<1.0	<1.0	---	<0.005	<0.005	<0.005	<0.005	1.3	---	---
GP8 @ 9'	1/10/00	9	<1.0	<1.0	---	<0.005	<0.005	<0.005	<0.005	4.1	---	---

Table 7. Analytical Results for Soil - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California

Sample ID	Sample Date	Sample Depth (in feet)	TPH-G	TPH-D	TPH-MO	Benzene	Toluene	Ethyl-Benzene	Xylenes	MTBE	Total Lead	HVOCs/ VOCs
			<---------- PPM ---------->									
GP8 @ 13'	1/10/00	13	<1.0	<1.0	---	<0.005	<0.005	<0.005	<0.005	1.5	---	---
GP9 @ 9'	1/11/00	9	<1.0	<1.0	---	<0.005	<0.005	<0.005	<0.005	0.15	---	---
GP9 @ 13'	1/11/00	13	<1.0	<1.0	---	<0.005	<0.005	<0.005	<0.005	0.79	---	---
GP10 @ 9'	1/11/00	9	<1.0	<1.0	---	<0.005	<0.005	<0.005	<0.005	0.58	---	---
GP10 @ 13'	1/11/00	13	<1.0	<1.0	---	<0.005	<0.005	<0.005	<0.005	0.80	---	---
GP11 @ 9'	1/11/00	9	310	210	---	<0.5	2.4	2.9	16	1.2	---	---
GP11 @ 13'	1/11/00	13	<1.0	<1.0	---	<0.005	<0.005	<0.005	<0.005	0.80	---	---
GP12 @ 8'	1/11/00	9	1.9	<1.0[7]	---	<0.005	0.02	0.01	0.02	0.29	---	---
GP12	1/11/00	13	<1.0	<1.0	---	<0.005	<0.005	<0.005	<0.005	0.07	---	---
GP13	1/11/00	8	11[6]	<1.0	---	0.007	<0.005	<0.005	<0.005	5.7	---	---
GP13	1/11/00	13	77	<1.0	---	<0.25	1.4	0.29	1.7	10	---	---
GP14	1/11/00	9	<1.0	<1.0	---	<0.005	<0.005	<0.005	<0.005	0.51	---	---
GP14	1/11/00	13	<25	<1.0	---	<0.13	<0.13	<0.13	<0.13	1.9	---	---
GP15	1/11/00	9	<1.0	<1.0	---	<0.005	<0.005	<0.005	<0.005	0.67	---	---
GP15	1/11/00	13	<1.0	<1.0	---	<0.005	<0.005	<0.005	<0.005	0.10	---	---
GP16	1/11/00	9	<1.0	<1.0	---	<0.005	<0.005	<0.005	<0.005	6.5	---	---
GP16	1/11/00	13	720	150	---	1.2	3.1	11	44	22	---	---
GP17	1/11/00	9	<50	<1.0	---	<0.25	<0.25	<0.25	<0.25	12	---	---
GP17	1/11/00	13	<1.0	<1.0	---	<0.005	<0.005	<0.005	<0.005	0.17	---	---

Table 7. Analytical Is for Soil - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California

Sample ID	Sample Date	)le h et)	TPH-G	TPH-D	TPH-MO	Benzene	Toluene	Ethyl-Benzene	Xylenes	MTBE	Total Lead	HVOCs/ VOCs
			<---------- PPM ---------->									
GP18	1/11/00		<1.0	<1.0	---	<0.005	<0.005	<0.005	<0.005	0.03	---	---
GP18	1/11/00		<1.0	<1.0	---	<0.005	<0.005	<0.005	<0.005	0.05	---	---
GP19	1/11/00		<1.0	16	---	<0.005	<0.005	<0.005	<0.005	2.5	---	---
GP19	1/11/00		<50	<1.0	---	<0.25	<0.25	<0.25	<0.25	13	---	---
GP19	1/11/00		<50	<1.0	---	<0.25	<0.25	<0.25	<0.25	3.8	---	---
GP20	1/11/00		<50	18	---	<0.25	<0.25	<0.25	<0.25	2.6	---	---
GP20	1/11/00		<50	<1.0	---	<0.25	<0.25	<0.25	<0.25	5.0	---	---
GP21	1/12/00		160	65	---	<0.5	0.53	2.7	10	<0.5	---	---
GP21	1/12/00	3	<1.0	<1.0	---	<0.005	<0.005	<0.005	<0.005	0.10	---	---
GP22	1/12/00		<1000	<1.0	---	<5.0	<5.0	<5.0	<5.0	13	---	---
GP22	1/12/00	3	<100	<1.0	---	<0.5	<0.5	<0.5	<0.5	3.0	---	---
GP23	1/12/00		<100	<1.0	---	<0.5	<0.5	<0.5	<0.5	2.6	---	---
GP23	1/12/00	3	32	180	---	<0.13	0.27	0.13	0.14	4.3	---	---
GP24	1/12/00		<1.0	<1.0	---	<0.005	<0.005	<0.005	<0.005	0.19	---	---
GP24	1/12/00	3	70	350	---	<0.13	0.36	0.15	0.46	<0.13	---	---
GP25	1/12/00		<1.0	<1.0	---	<0.005	<0.005	<0.005	<0.005	<0.005	---	---
GP25	1/12/00	3	5.1	<1.0	---	0.59	0.03	0.04	0.004	0.02	---	---
GP26	1/12/00	9	<1.0	<1.0	---	0.01	<0.005	<0.005	<0.005	0.02	---	---
GP26	1/12/00	3	<1.0	<1.0	---	<0.005	<0.005	<0.005	<0.005	<0.005	---	---

Table 7. Analytical Results for Soil - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California

Sample ID	Sample Date	Sample Depth (in feet)	TPH-G	TPH-D	TPH-MO	Benzene	Toluene	Ethyl-Benzene	Xylenes	MTBE	Total Lead	HVOCs/ VOCs
			<---------- PPM ---------->									
GP27	1/12/00	9	<1.0	<1.0	---	<0.005	<0.005	<0.005	<0.005	<0.005	---	---
GP27	1/12/00	13	<25	<1.0	---	<0.13	<0.13	<0.13	<0.13	0.74	---	---
GP28	1/12/00	9	<1.0	<1.0	---	<0.005	<0.005	<0.005	<0.005	<0.005	---	---
GP28	1/12/00	13	<1.0	<1.0	---	<0.005	<0.005	<0.005	<0.005	<0.005	---	---
GP29	1/12/00	9	<1.0	<1.0	---	<0.005	<0.005	<0.005	<0.005	0.20	---	---
GP29	1/12/00	13	<25	<1.0	---	<0.13	<0.13	<0.13	<0.13	0.42	---	---
GP30	1/12/00	9	<1.0	<1.0	---	<0.005	<0.005	<0.005	<0.005	0.17	---	---
GP30	1/12/00	13	<100	<1.0	---	<0.5	<0.5	<0.5	<0.5	1.5	---	---
GP31	1/12/00	9	<5.0	<1.0	---	<0.03	<0.03	<0.03	<0.03	0.13	---	---
GP31	1/12/00	13	<50	<1.0	---	<0.25	<0.25	<0.25	<0.25	2.8	---	---
GP32	1/12/00	9	<1.0	<1.0	---	<0.005	<0.005	<0.005	<0.005	0.05	---	---
GP32	1/12/00	13	29	<1.0	---	<0.03	0.39	0.05	0.29	4.5	---	---
GP33	1/12/00	9	<5.0	<1.0	---	<0.03	<0.03	<0.03	<0.03	0.17	---	---
GP33	1/12/00	13	<5.0	<1.0	---	<0.03	<0.03	<0.03	<0.03	0.11	---	---
S-1	12/10/99	17	870	200	---	<2.5	3.6	22	64	12	4.0	---
S-2	12/10/99	18	4,100[5]	<1.0	---	9.9	340	130	850	<50	2.3	---
S-3	12/10/99	18	13,000[5]	1,300	<50	60	870	290	1,600	33	2.8	---
S-5	12/10/99	20.5	11,000[5]	850	<50	68	750	230	1,400	<50	5.6	---
S-6	12/10/99	17	2,300	1,600	<50	16	110	56	290	<5.0	3.2	---

Table 7. An Results for Soil - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California

Sample ID	Sample Depth (in feet)	TPH-G	TPH-D	TPH-MO	Benzene	Toluene	Ethyl-Benzene	Xylenes	MTBE	Total Lead	HVOCs/ VOCs
		<---------- PPM ---------->									
S-7	18	810	2,100	<50	7.5	6.2	14	34	3.5	2.7	---
S-8	18	310	2,000	<50	3.3	2.7	6.6	3.1	1.9	2.9	---
S-9	18	480	810	<50	0.96	4.1	16	4.4	1.4	2.0	---
S-10	18	10	81	<50	0.06	0.11	0.13	0.43	0.16	2.5	---
S-11	18	710	2,500	<50	6.4	2.3	6.2	9.8	5.0	2.9	---
S-12	18	22,000	1,300	<50	53	540	550	1,300	14	4.6	---
S-13	18	2,100	780	<50	5.9	110	51	270	8.2	4.3	---
S-14	18	1,600	420	<50	<5.0	10	35	170	12	3.7	---
P-1	3	1.2	<1.0	---	<0.005	0.01	0.01	0.02	---	4.8	---
P-2	3	69	340	---	<0.25	0.37	<0.25	0.72	---	5.8	---
P-3	3	350	170[1]	---	0.67	2.1	1.5	6.1	6.3	70	---
P-4	3	2.3	<1.0	---	0.01	0.006	0.008	0.03	---	5.6	---
P-5	3	1.0	<1.0	---	0.008	0.03	<0.005	0.02	---	5.0	---

Table 7. Analytical Results for Soil - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California

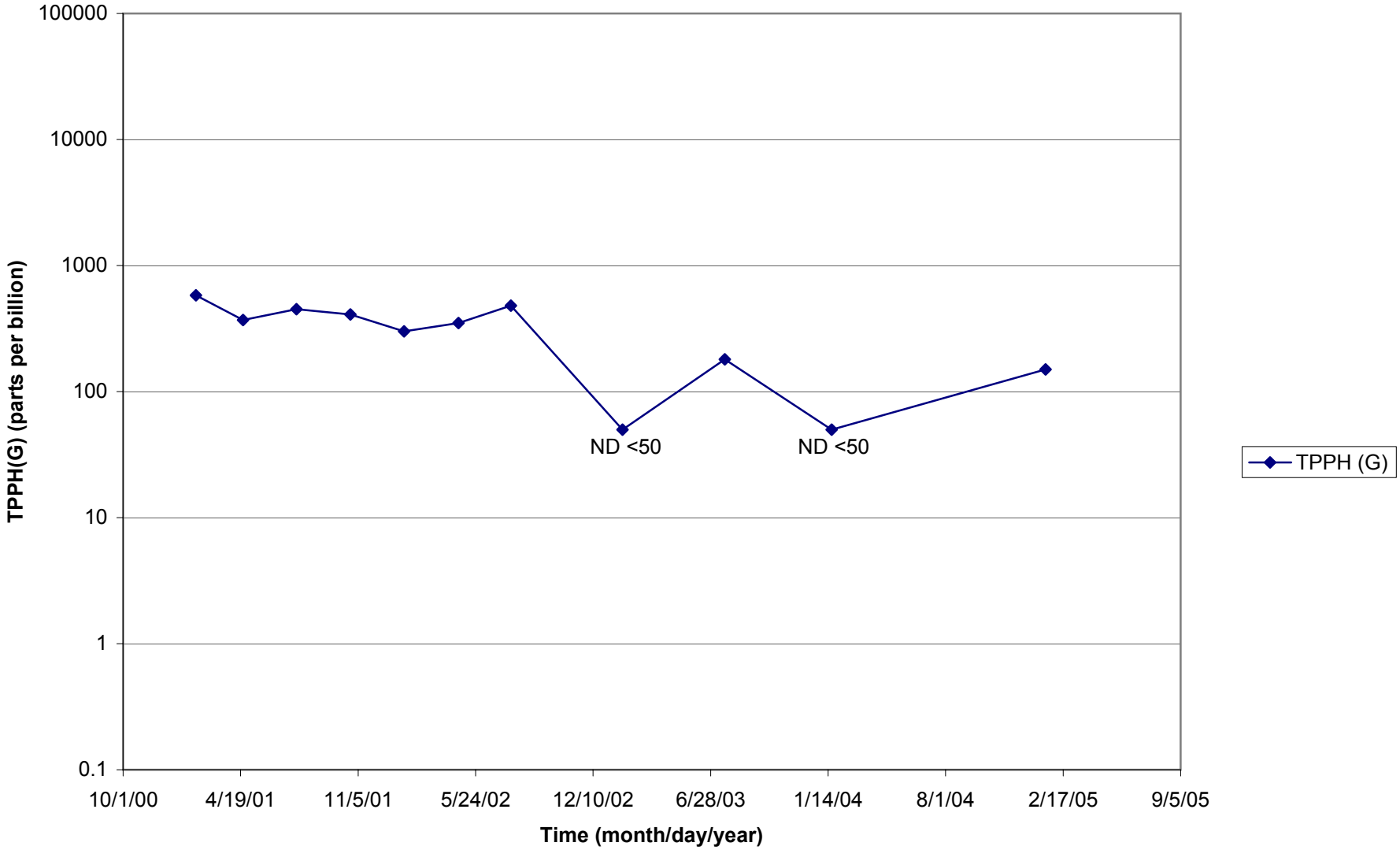
Explanation:

TPH-G = Total Petroleum Hydrocarbons as Gasoline
TPH-D = Total Petroleum Hydrocarbons as Diesel
TPH-MO = Total Petroleum Hydrocarbons as Motor Oil
MTBE = Methyl-tert-butyl-ether
PPM = Parts per Million
HVOCs = Halogenated Volatile Organic Compounds
--- = not analyzed

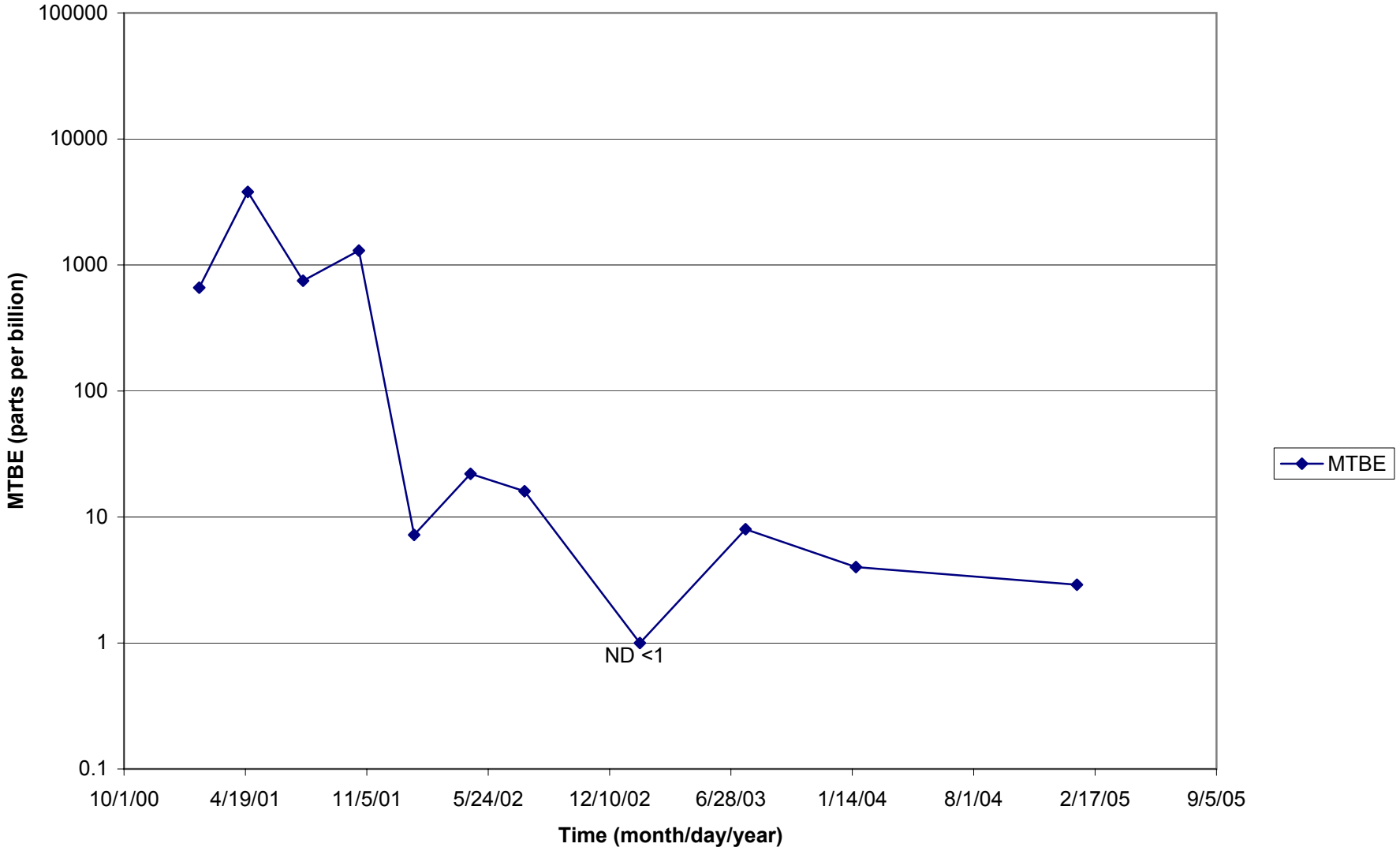
Notes:

1. VOCs not detected at detection limits from 0.005 to 0.5 ppm
2. 2-Hexanone detected at 25 ppm. Other VOCs not detected at detection limits from 0.005 to 0.010 ppm
3. HVOCs were not detected at detection limits ranging from 0.002 to 0.05 ppm
4. 1,2-Dechloroethane detected at 0.025 ppm Other HVOCs not detected at detection limits from 0.004 to 0.1 ppm.
5. TPH(G) was present in the diesel range.
6. TPH(G) result represents mostly MTBE
7. TPH motor oil was present in the diesel range

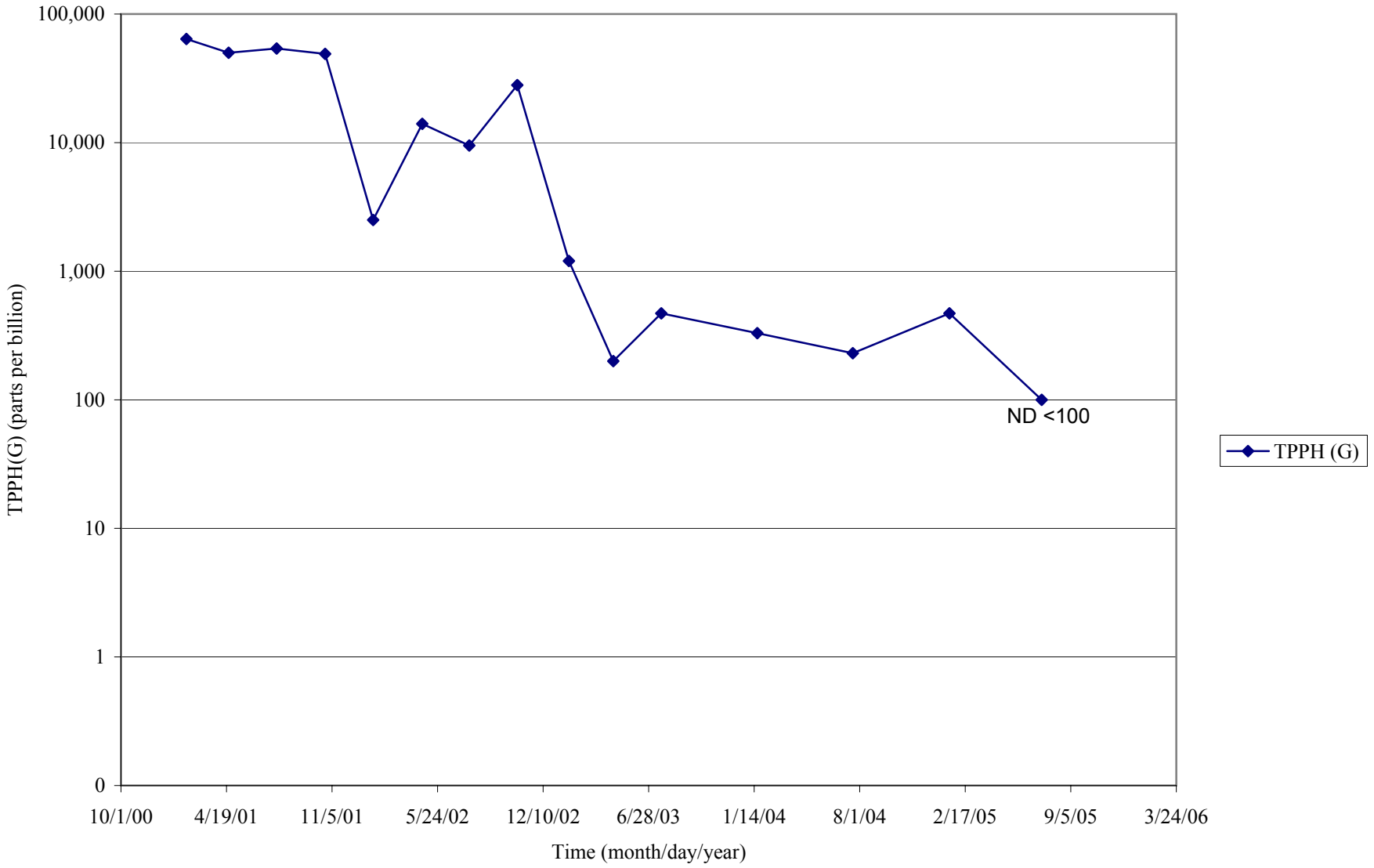
APPENDIX C
GRAPHS



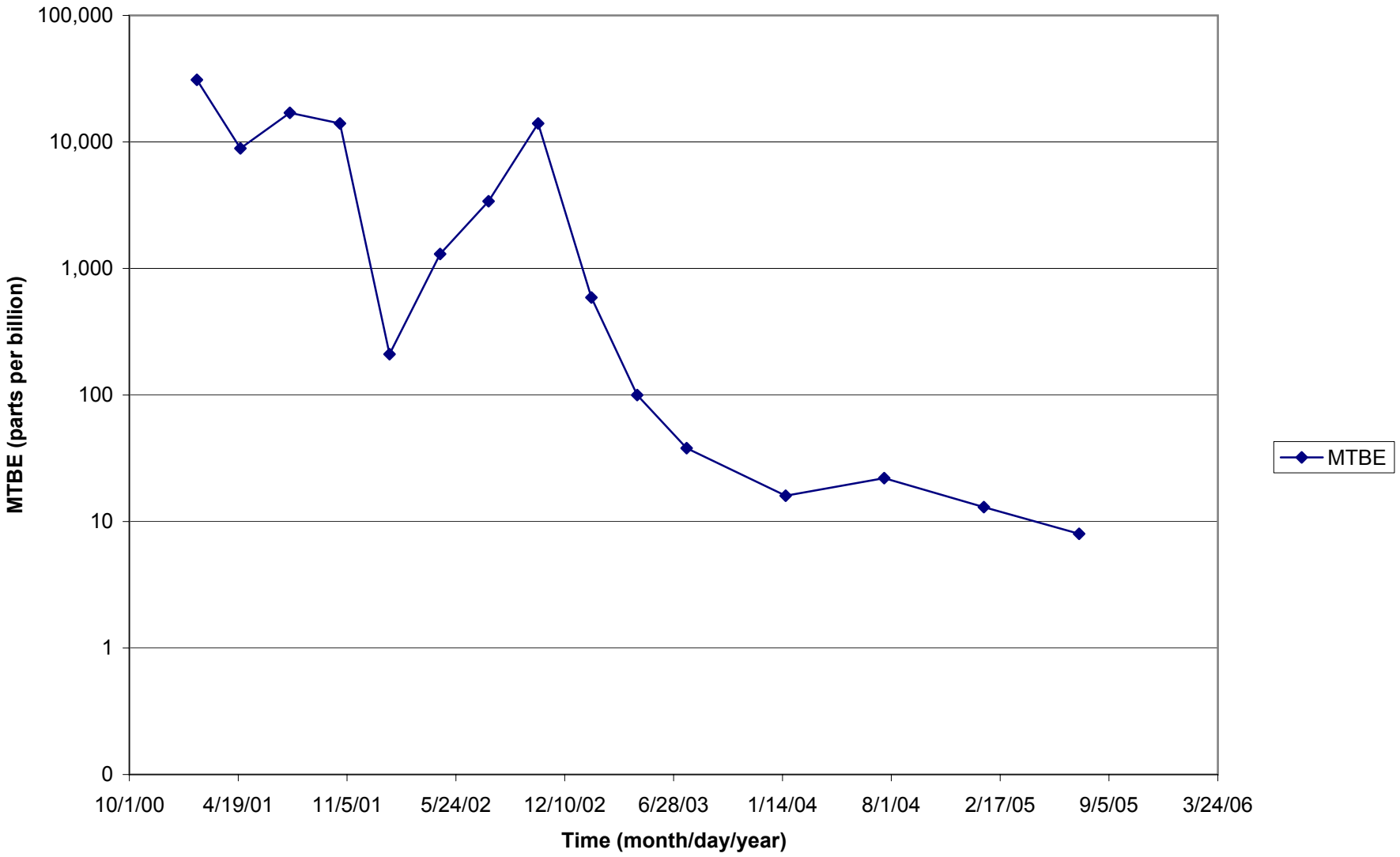
Graph 1: MW-1: TPPH (G) vs. Time - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California



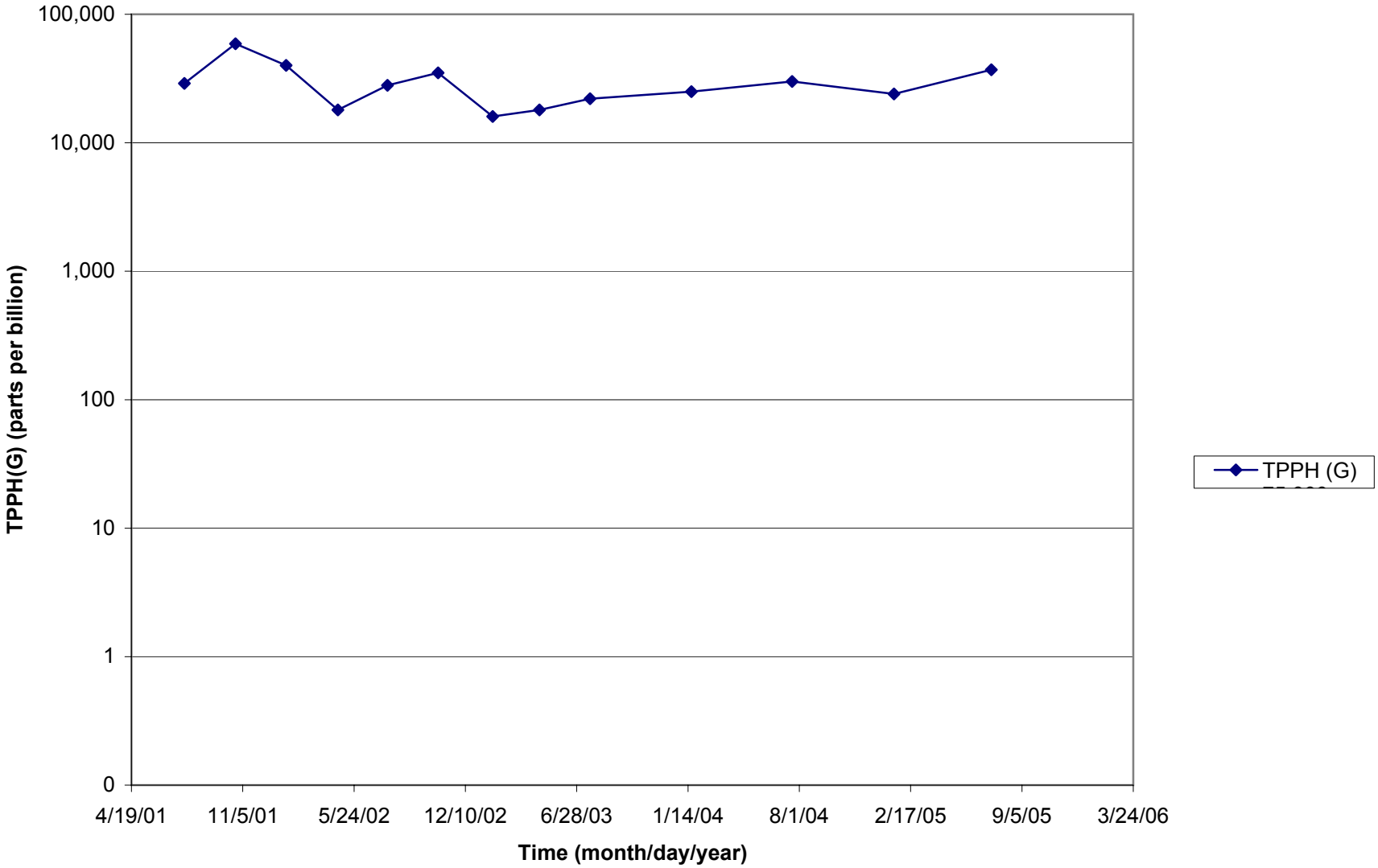
Graph 2: MW-1: MTBE vs. Time - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California



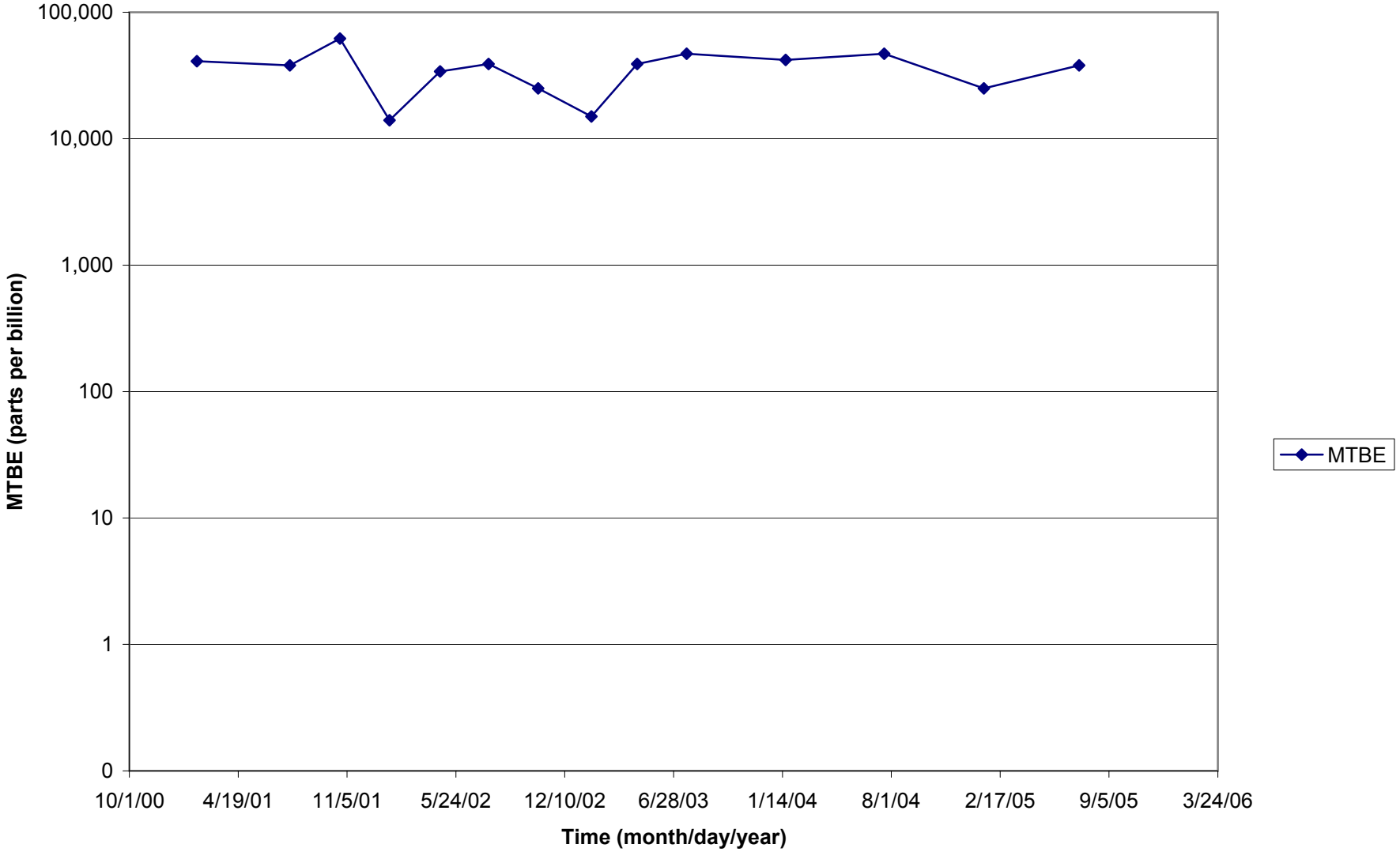
Graph 3: MW-2: TPPH (G) vs. Time - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California



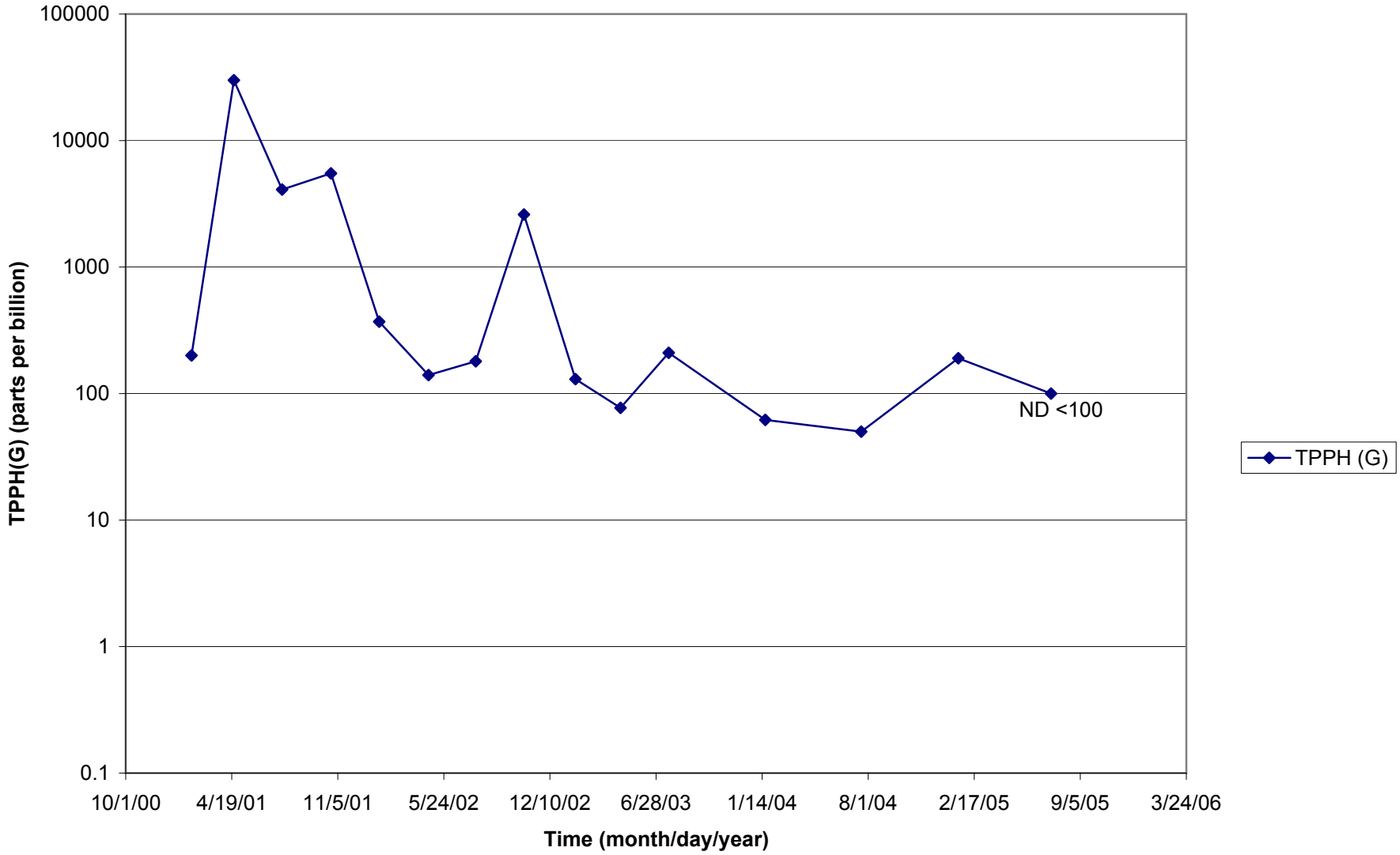
Graph 4: MW-2: MTBE vs. Time - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California



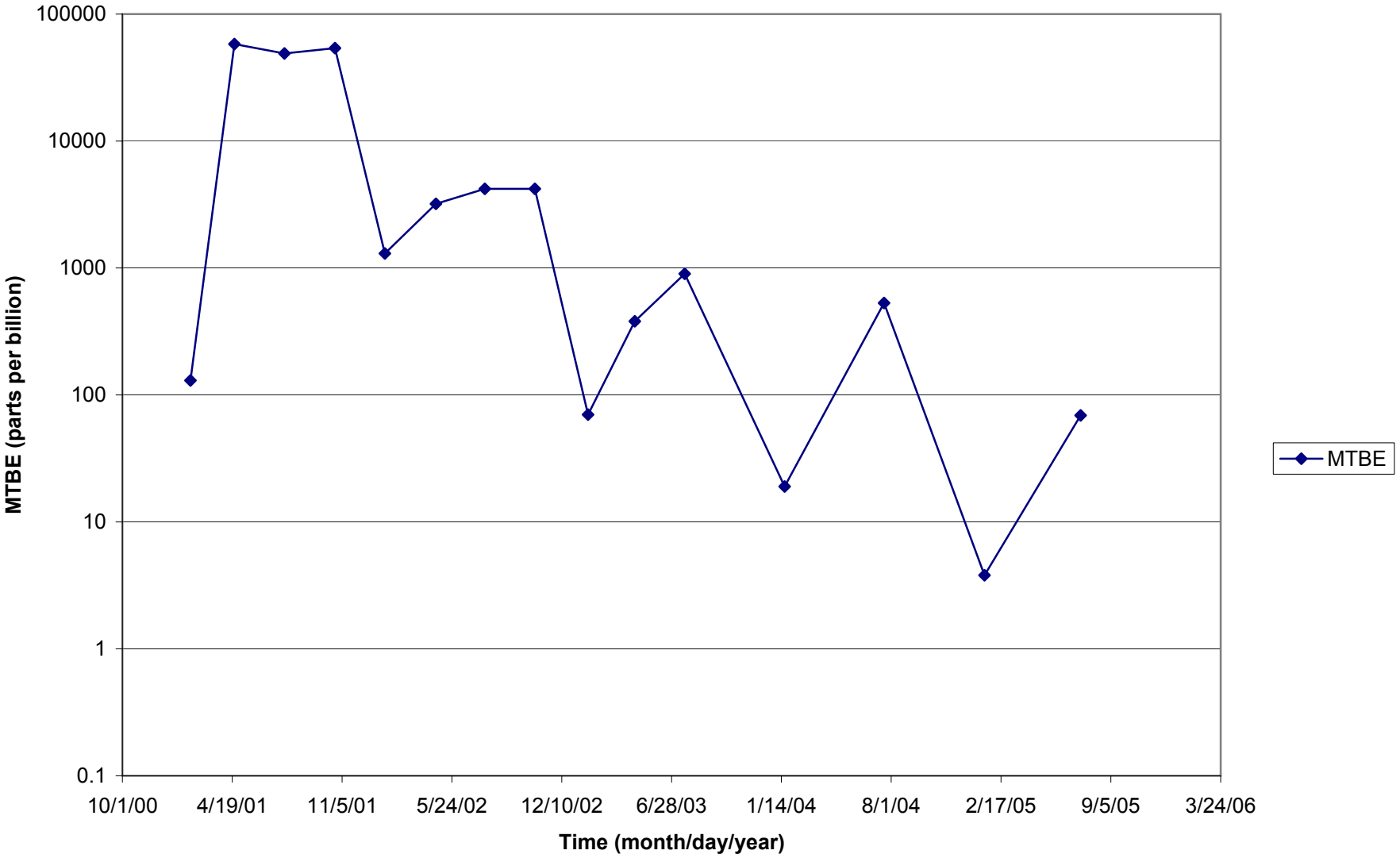
Graph 5: MW-3: TPPH (G) vs. Time - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California



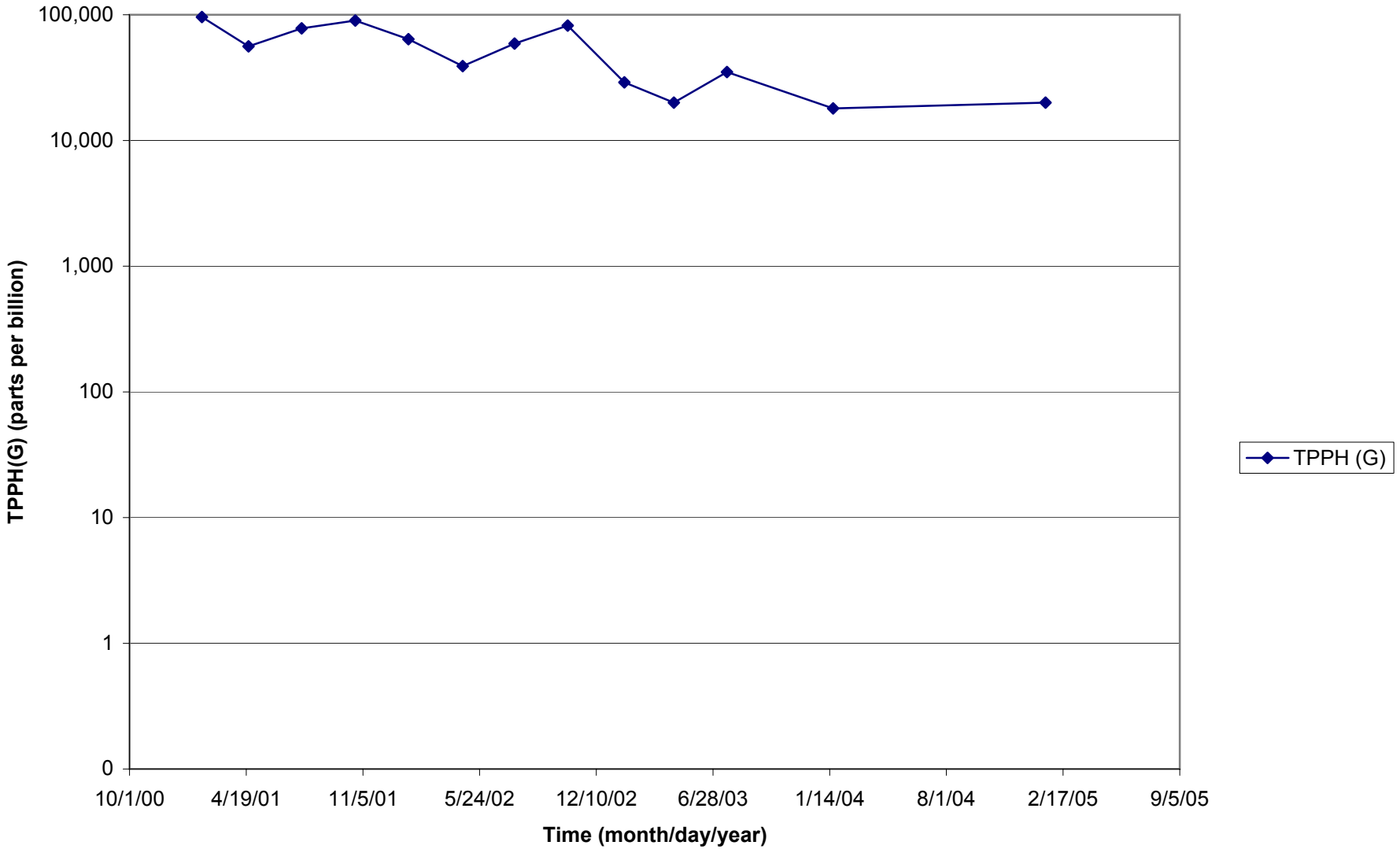
Graph 6: MW-3: MTBE vs. Time - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California



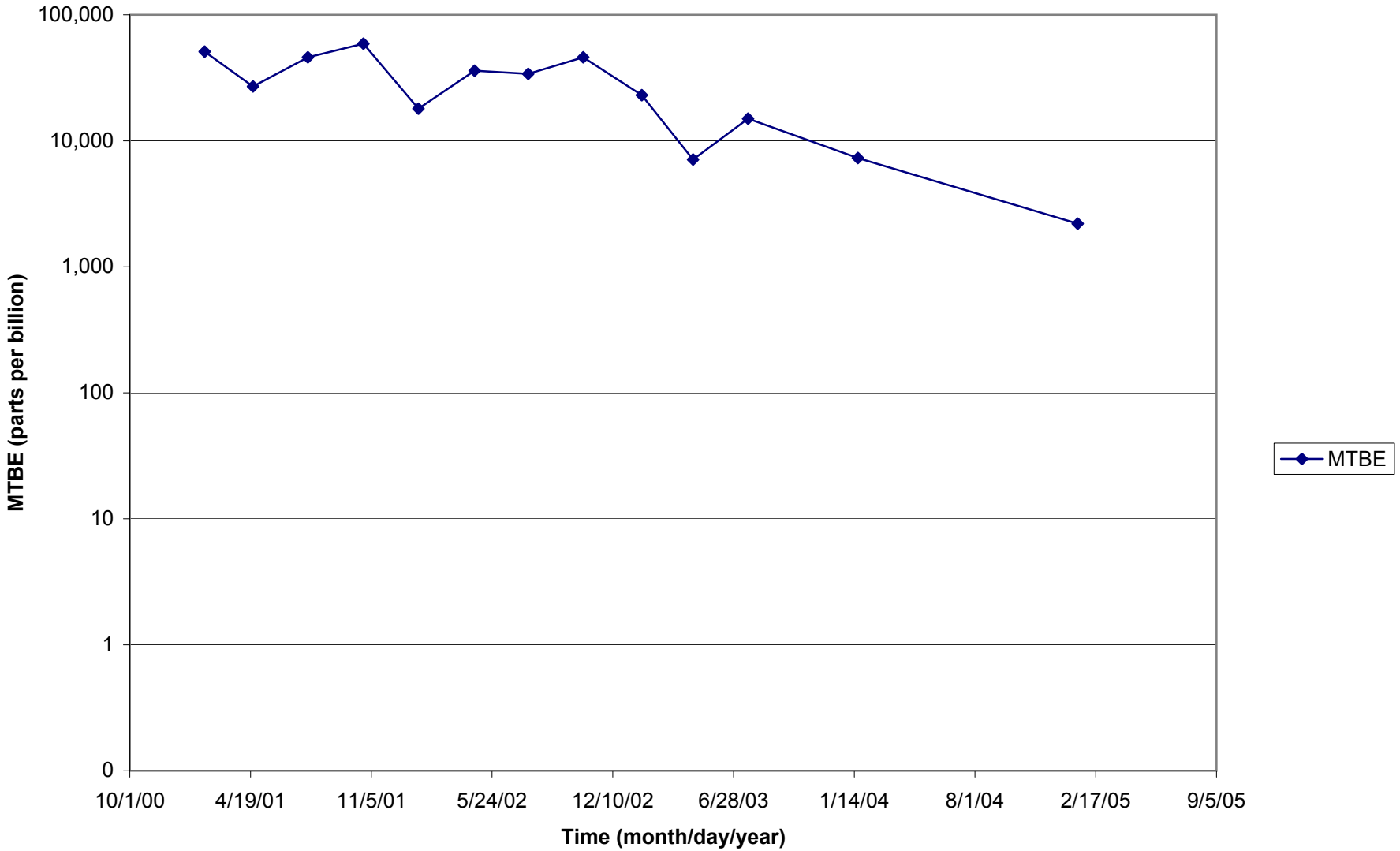
Graph 7: MW-4: TPPH (G) vs. Time - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California



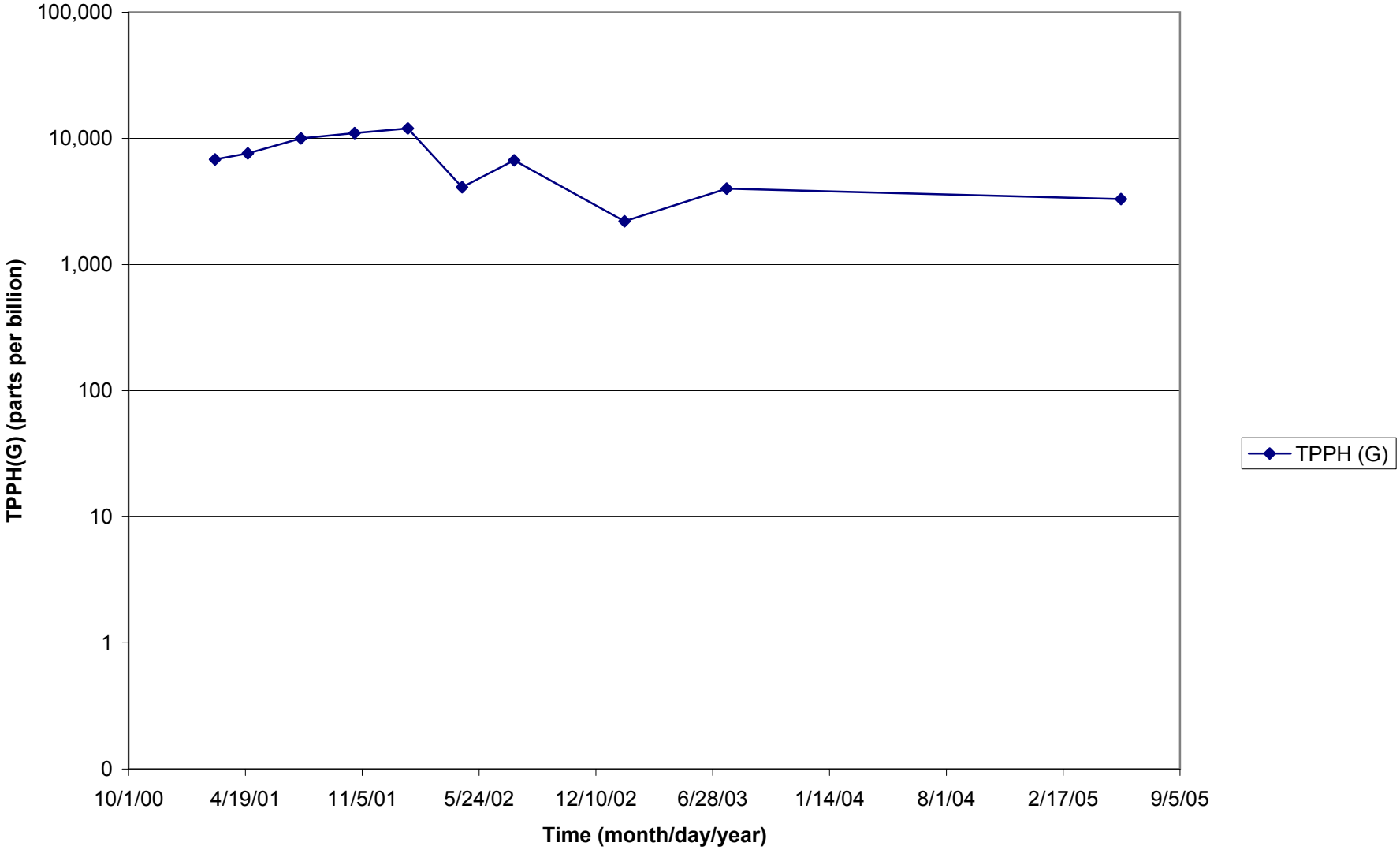
Graph 8: MW-4: MTBE vs. Time - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California



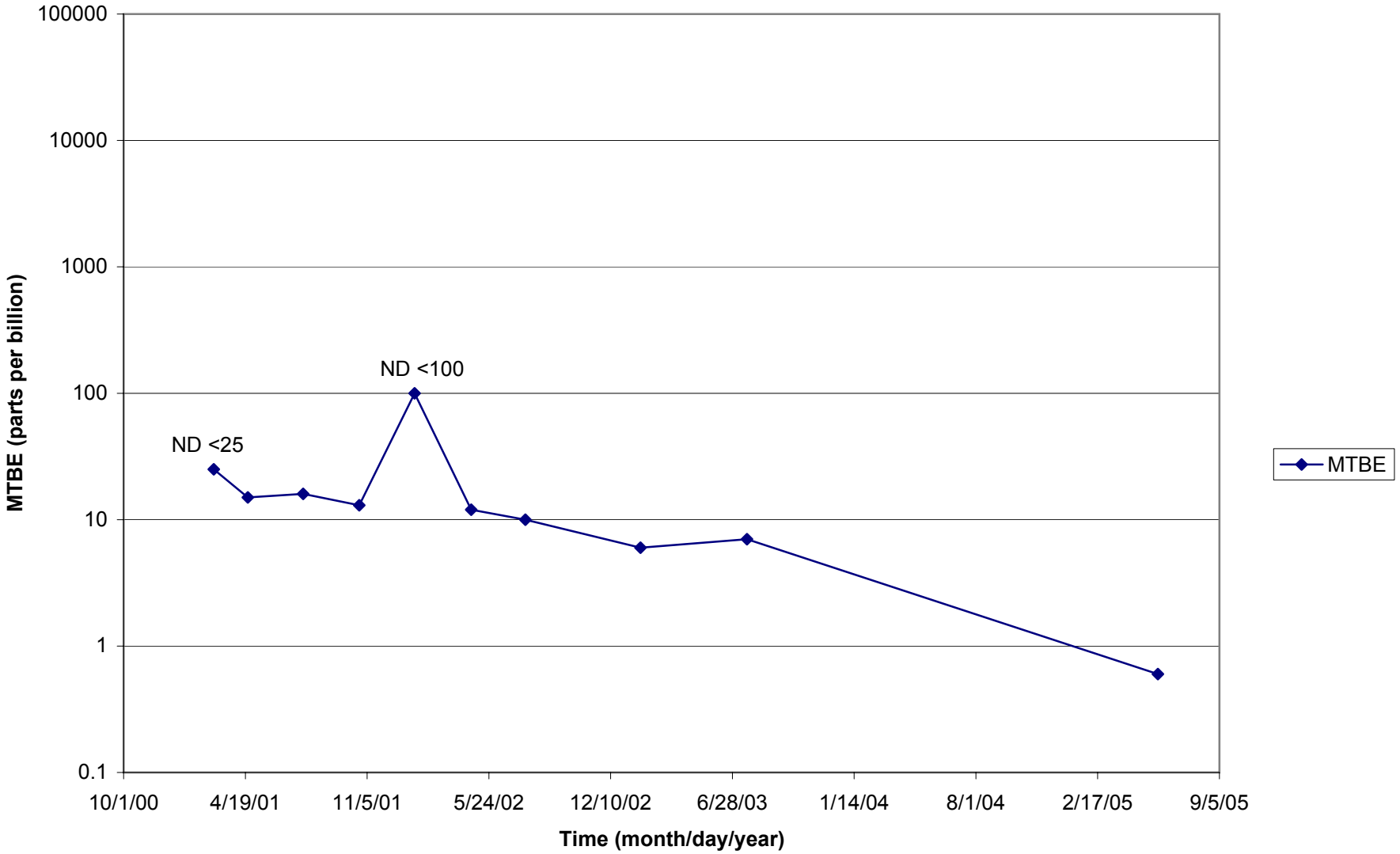
Graph 9: MW-10: TPPH (G) vs. Time - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California



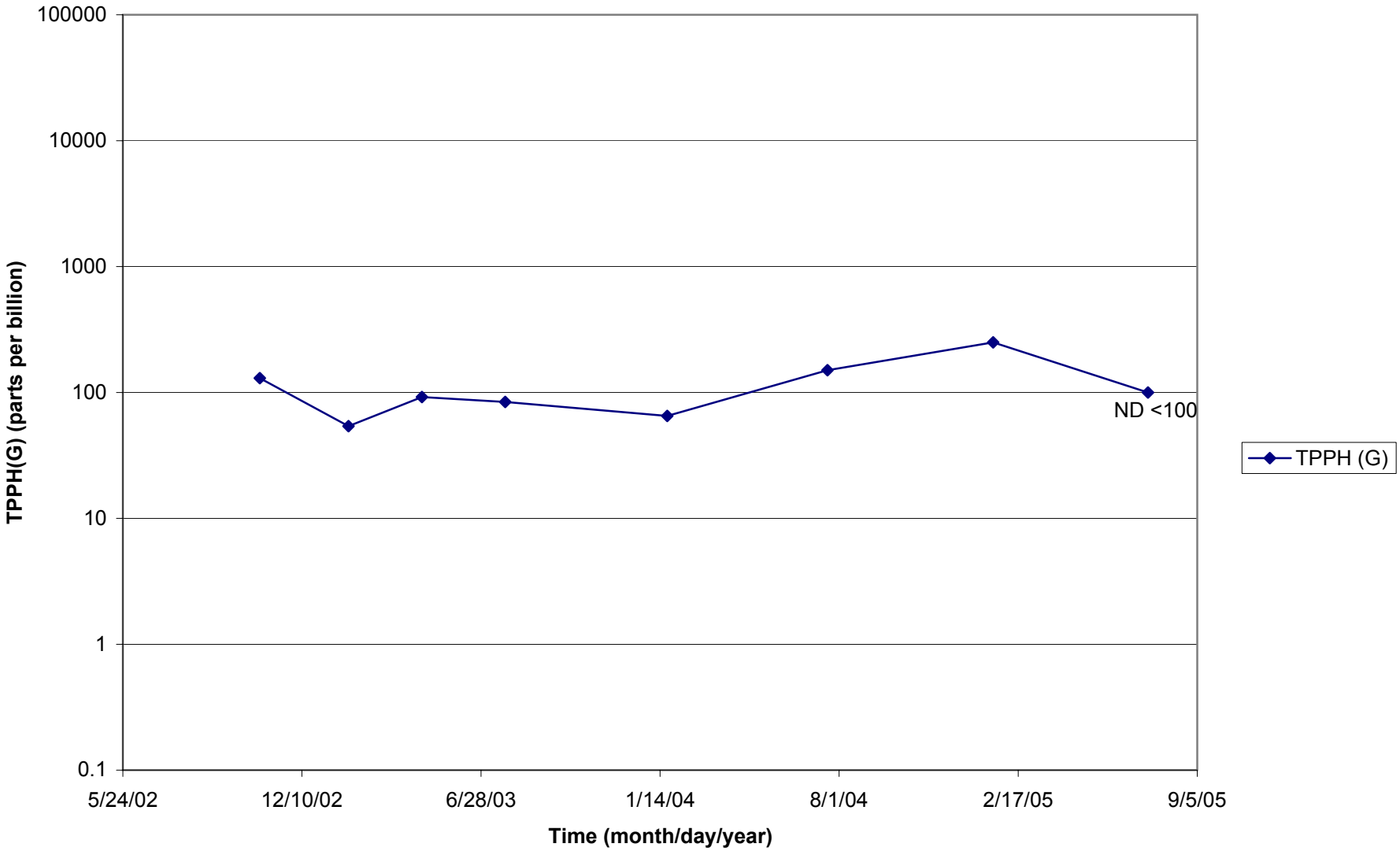
Graph10: MW-10: MTBE vs. Time - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California



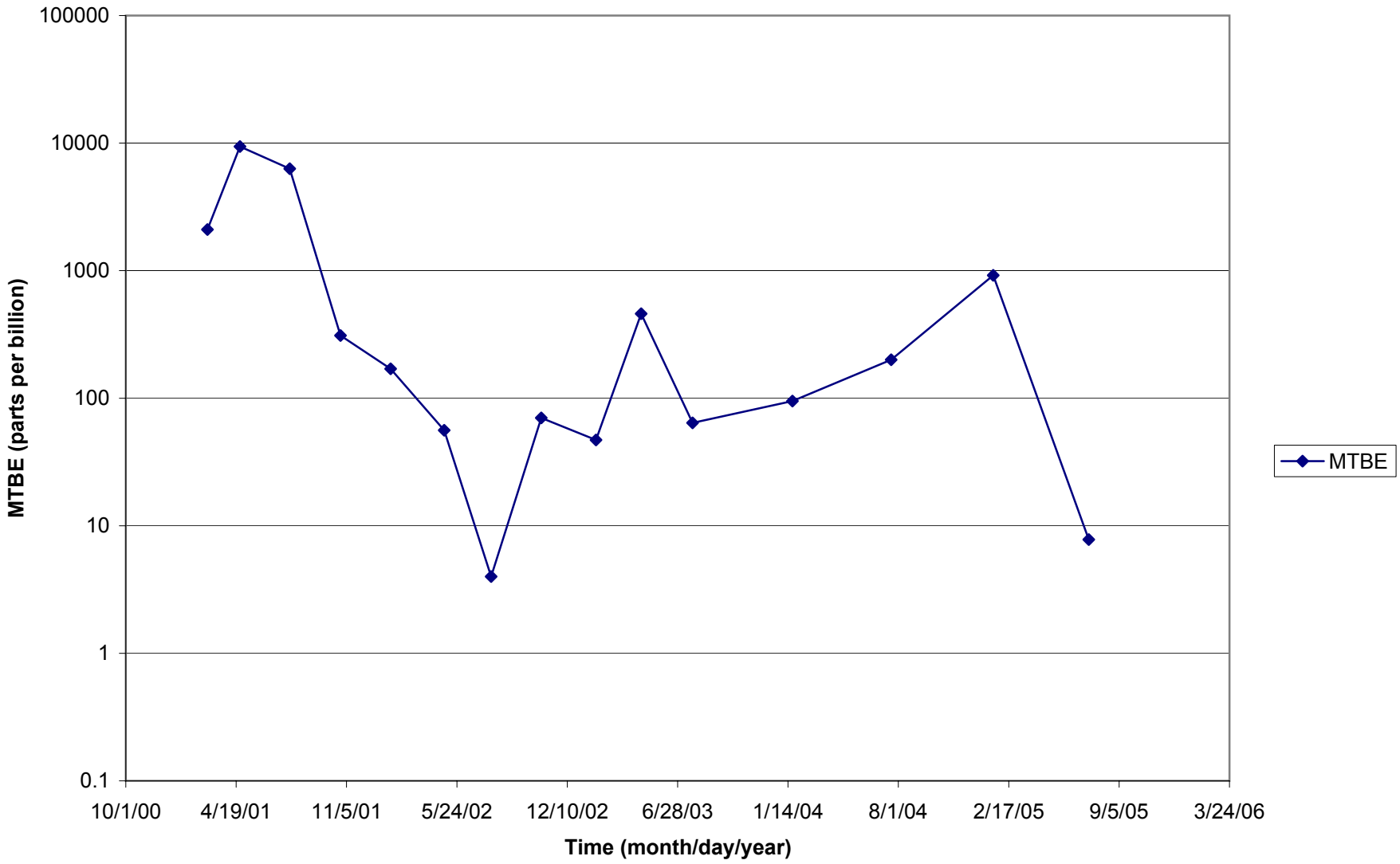
Graph 11: V-1: TPPH (G) vs. Time - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California



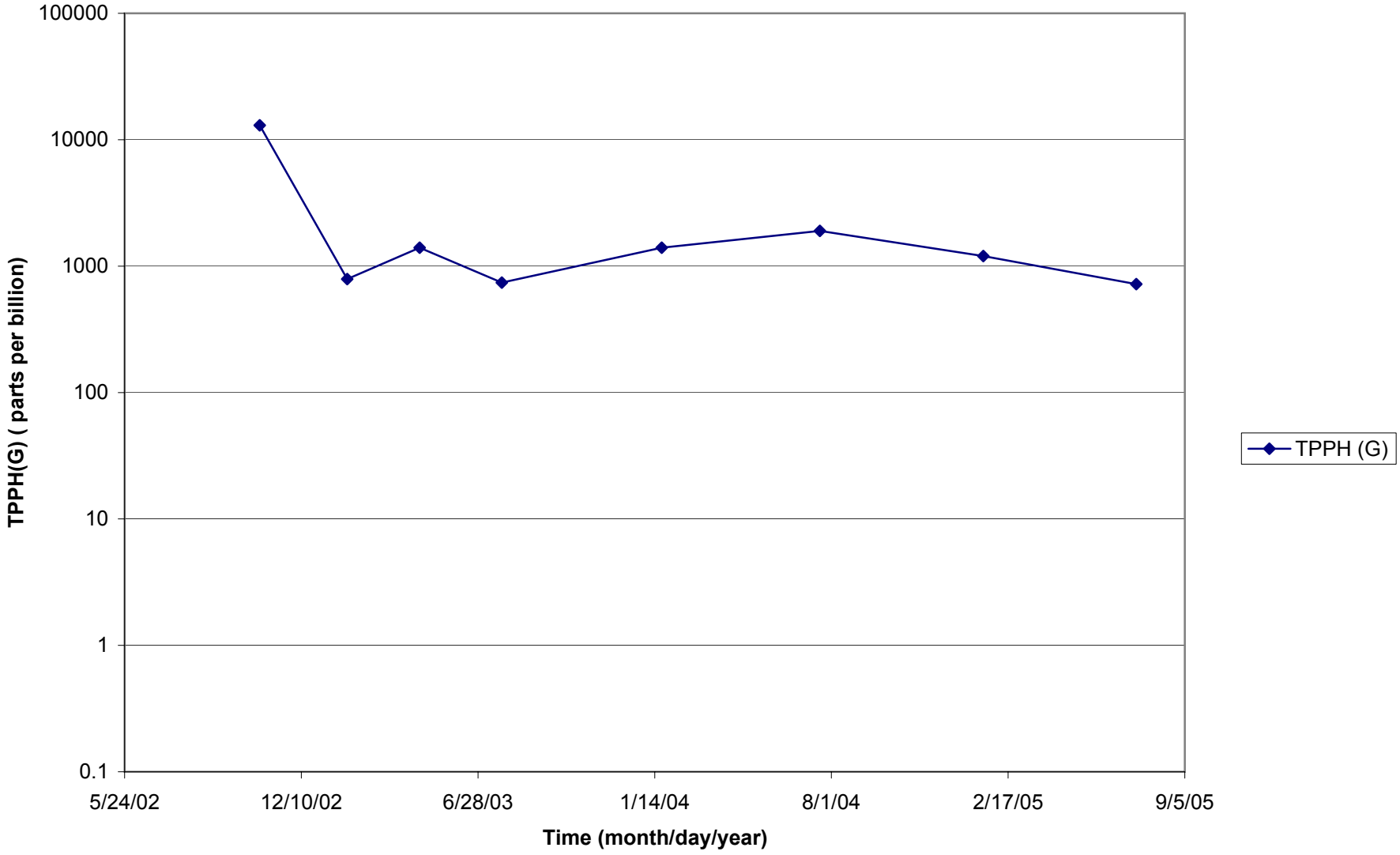
Graph 12: V-1: MTBE vs. Time - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California



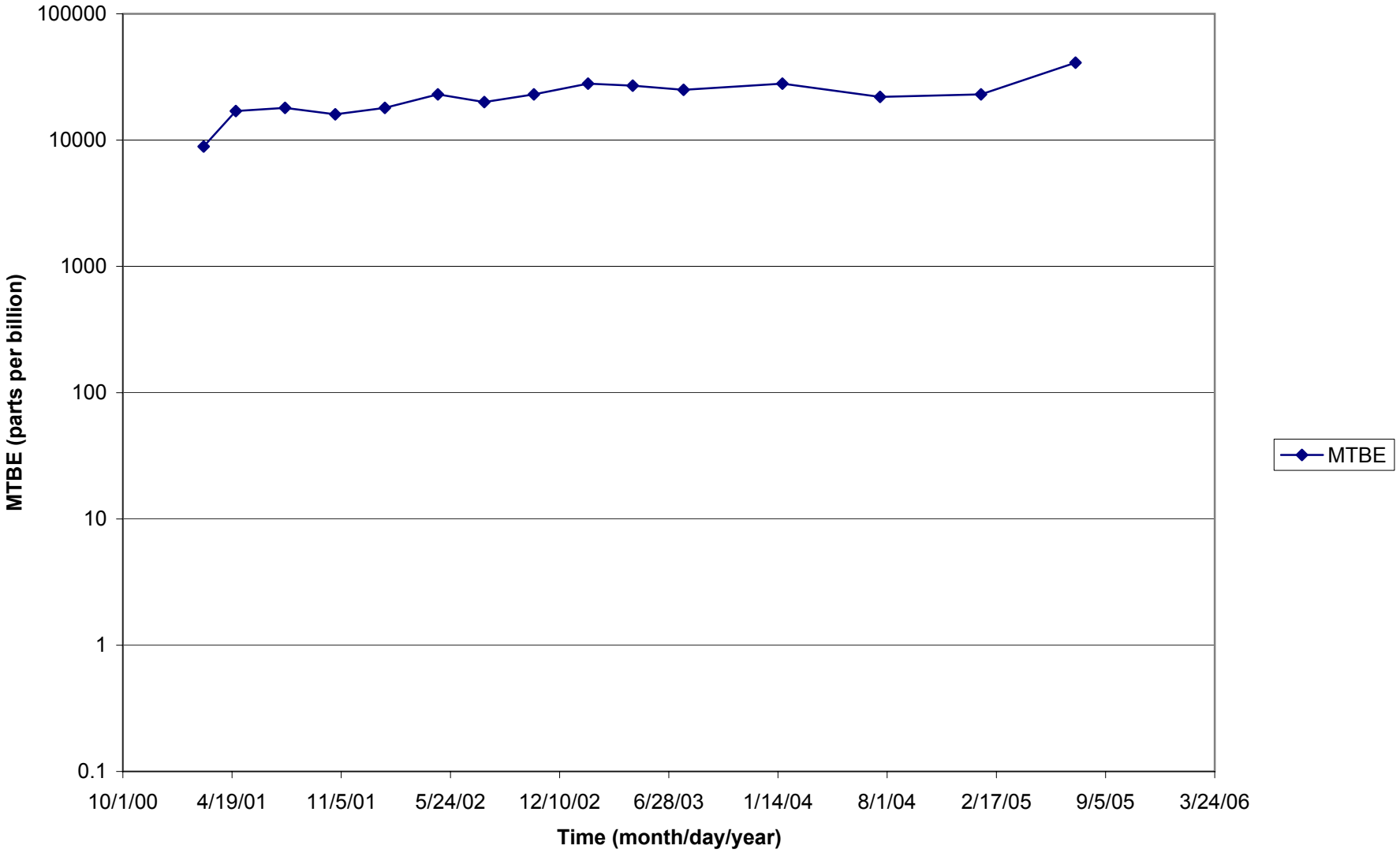
Graph 13: MW-21 at 24 Feet: TPPH(G) vs. Time - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California



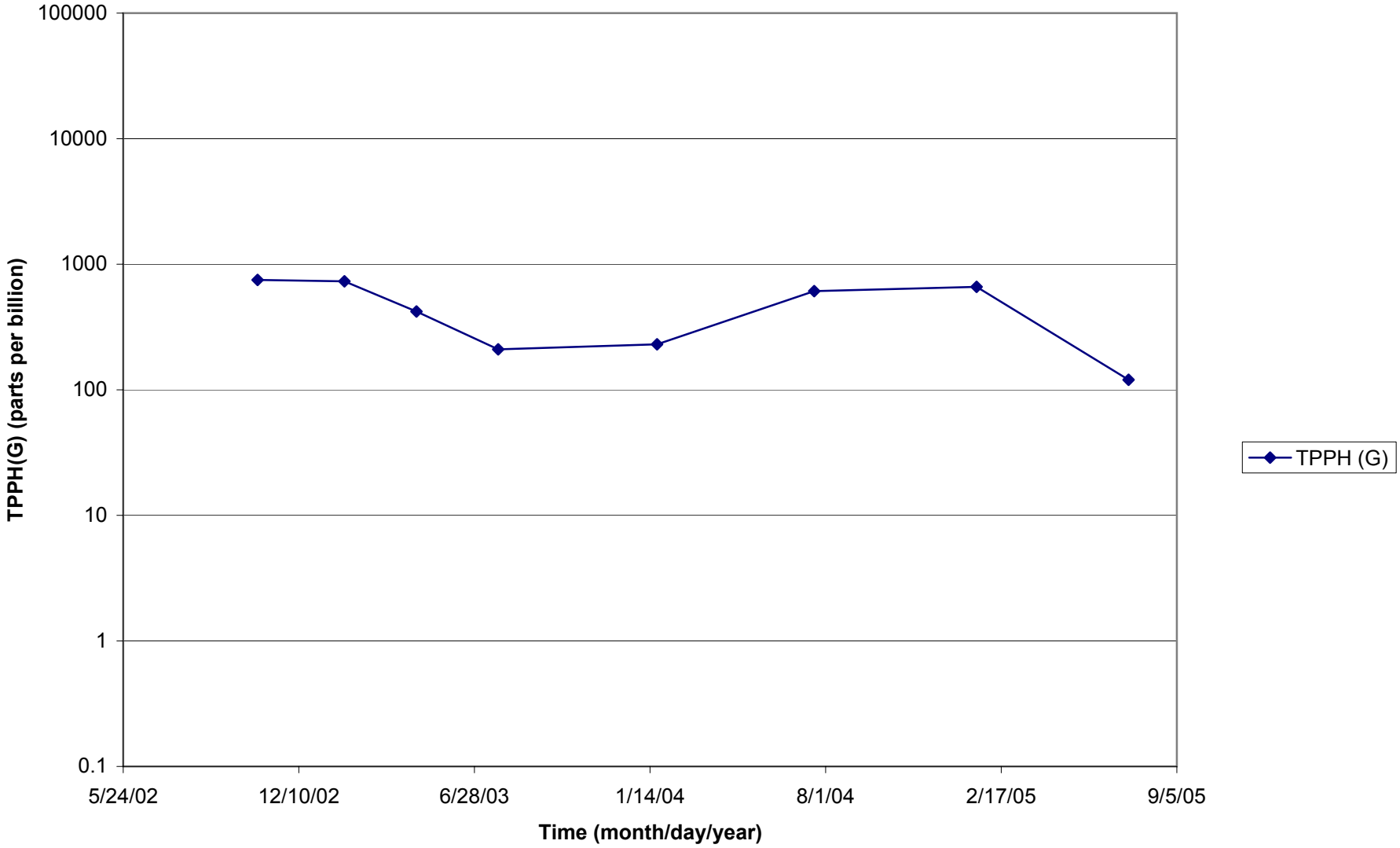
Graph 14: MW-21 at 24 Feet: MTBE vs. Time - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California



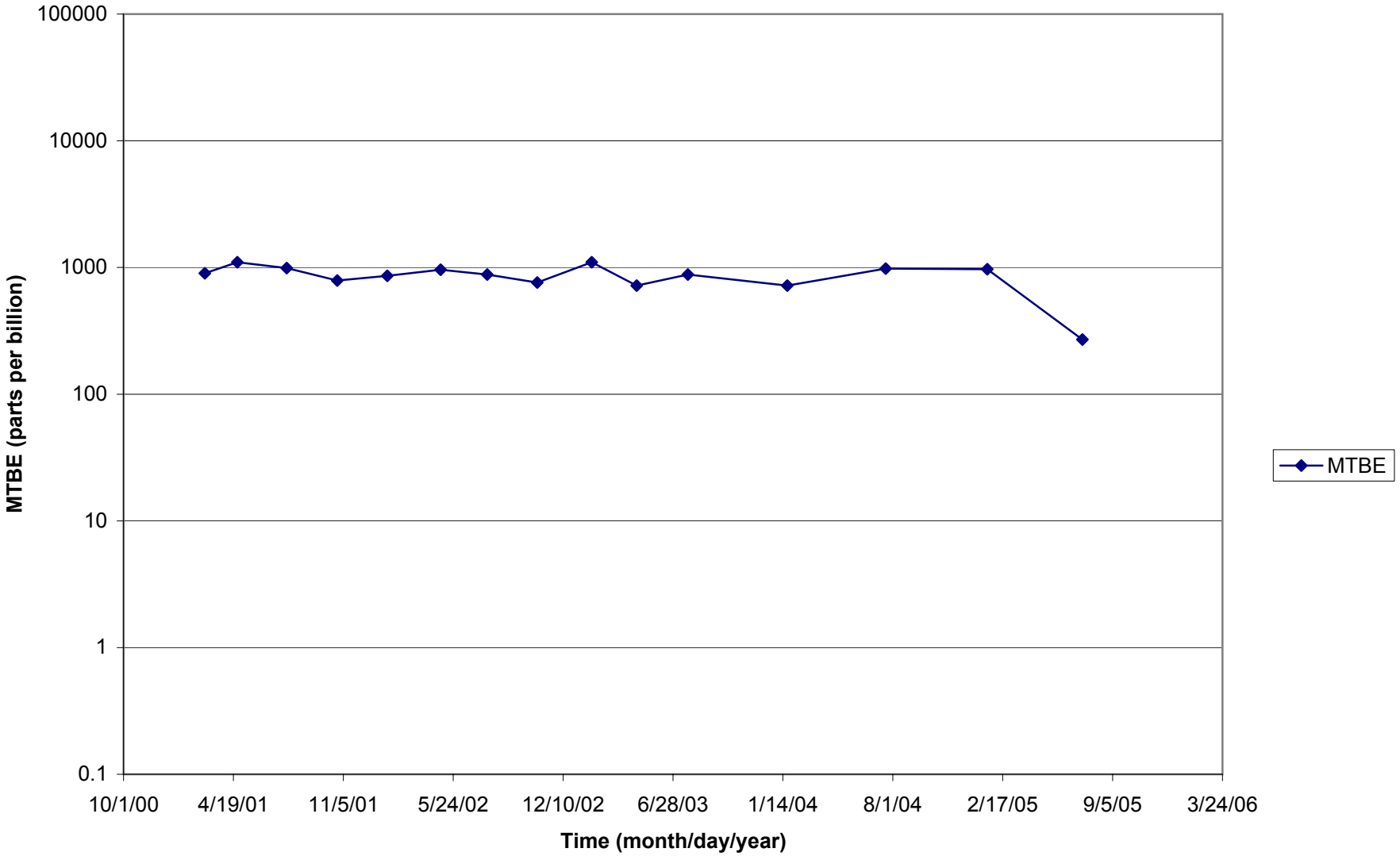
Graph 15: MW-21 at 75 Feet: TPPH (G) vs. Time - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California



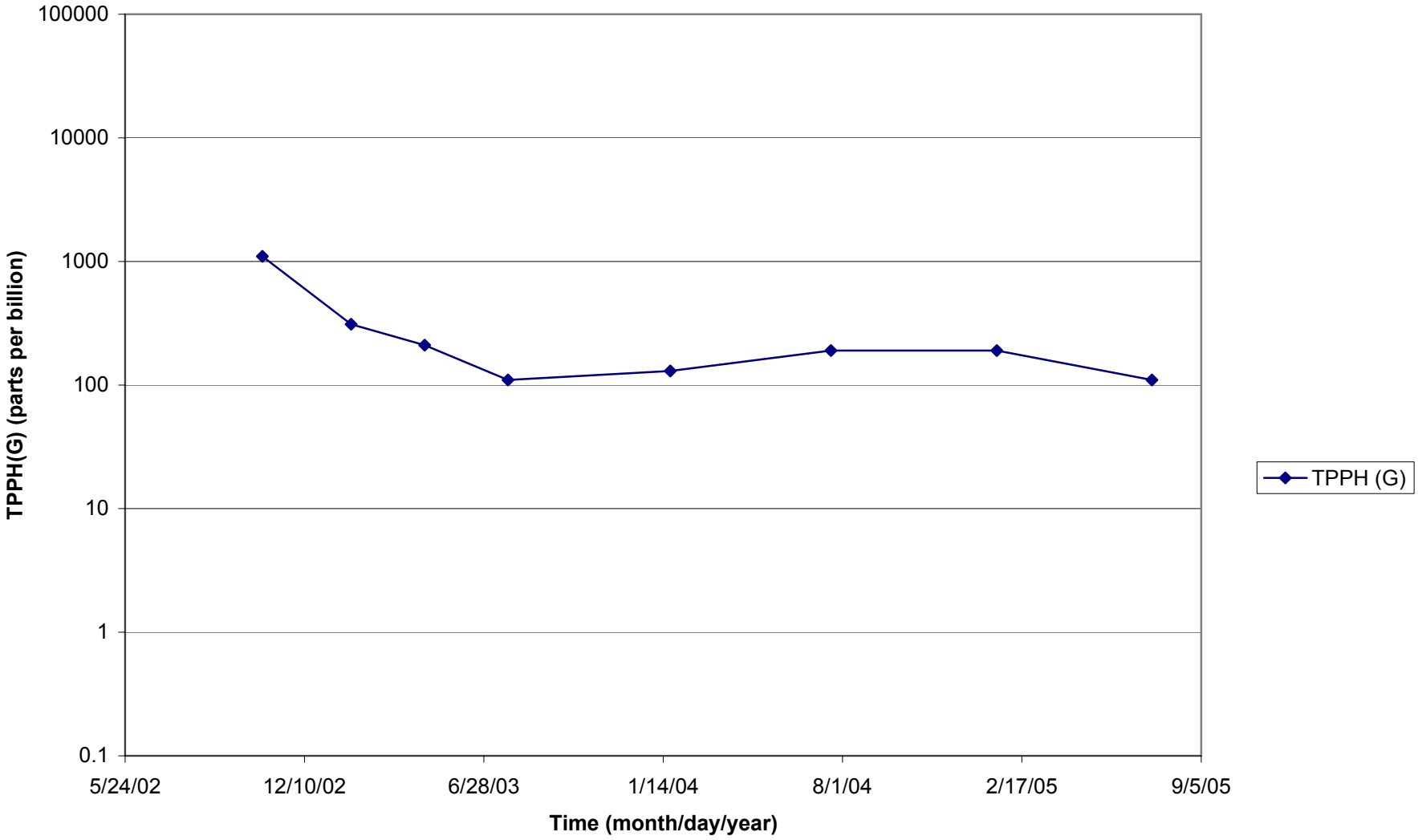
Graph 16: MW-21 at 75 Feet: MTBE vs Time - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California



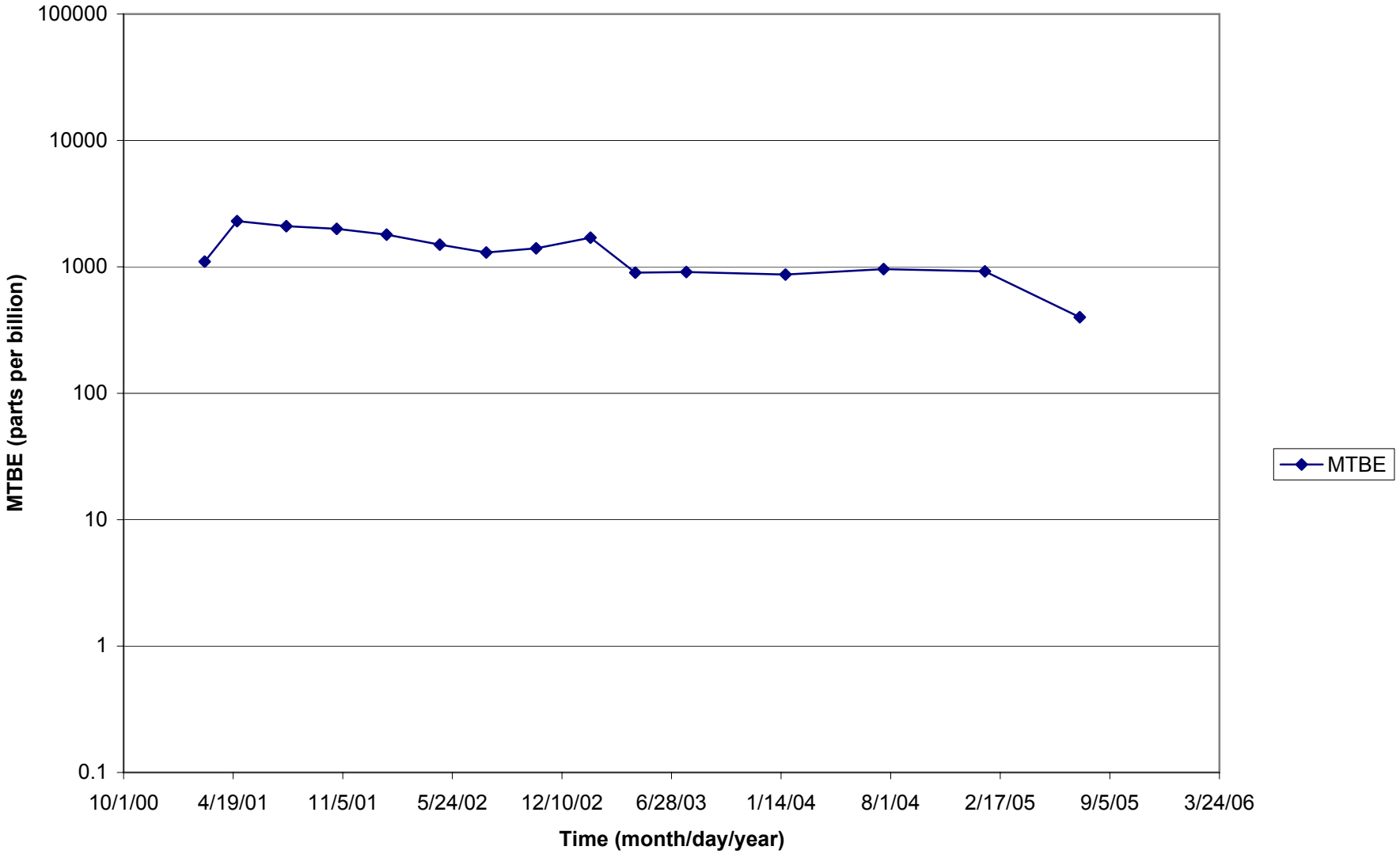
Graph 17: MW-21 at 143 Feet: TPPH (G) vs. Time - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California



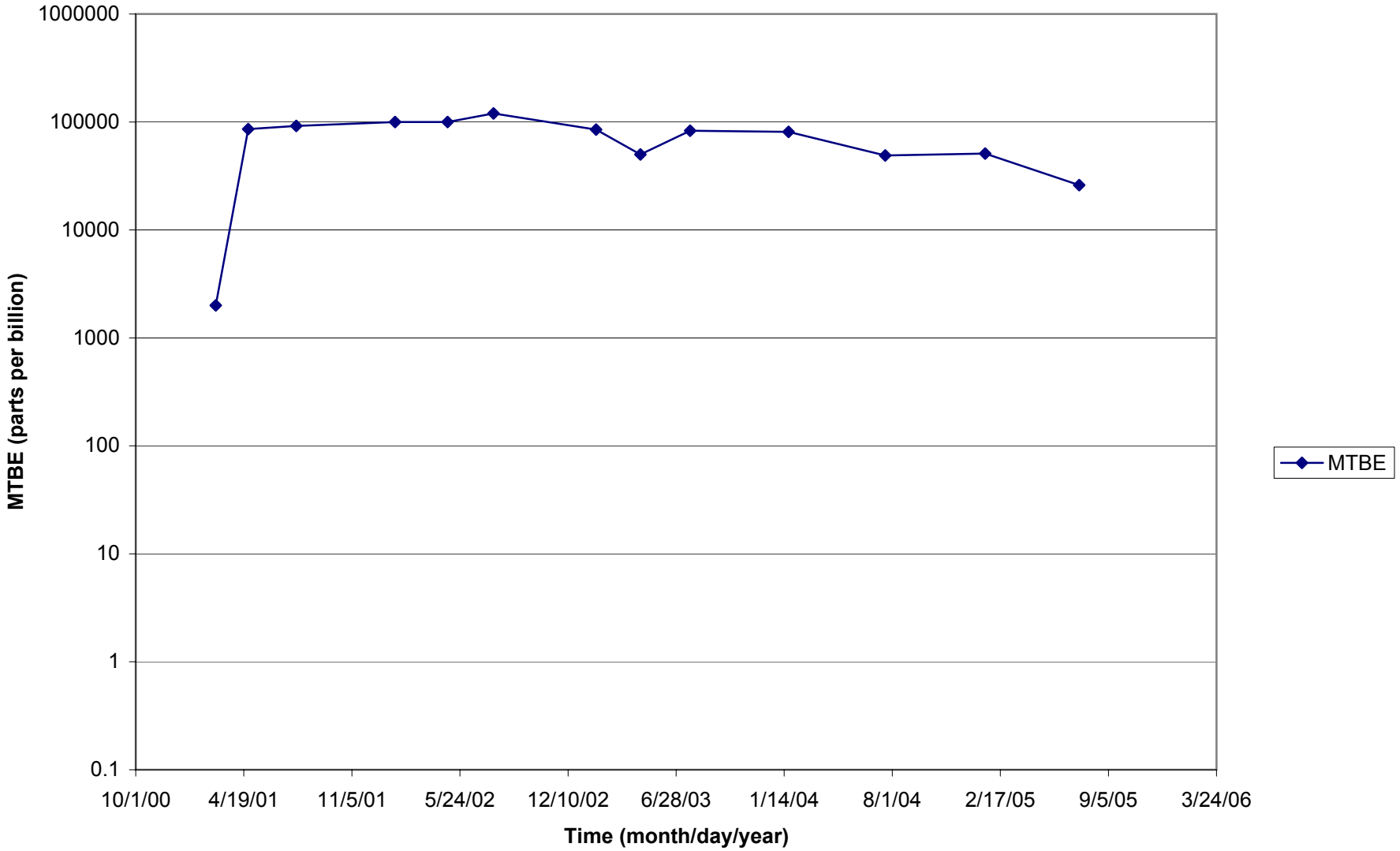
Graph 18: MW-21 at 143 Feet: MTBE vs. Time - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California



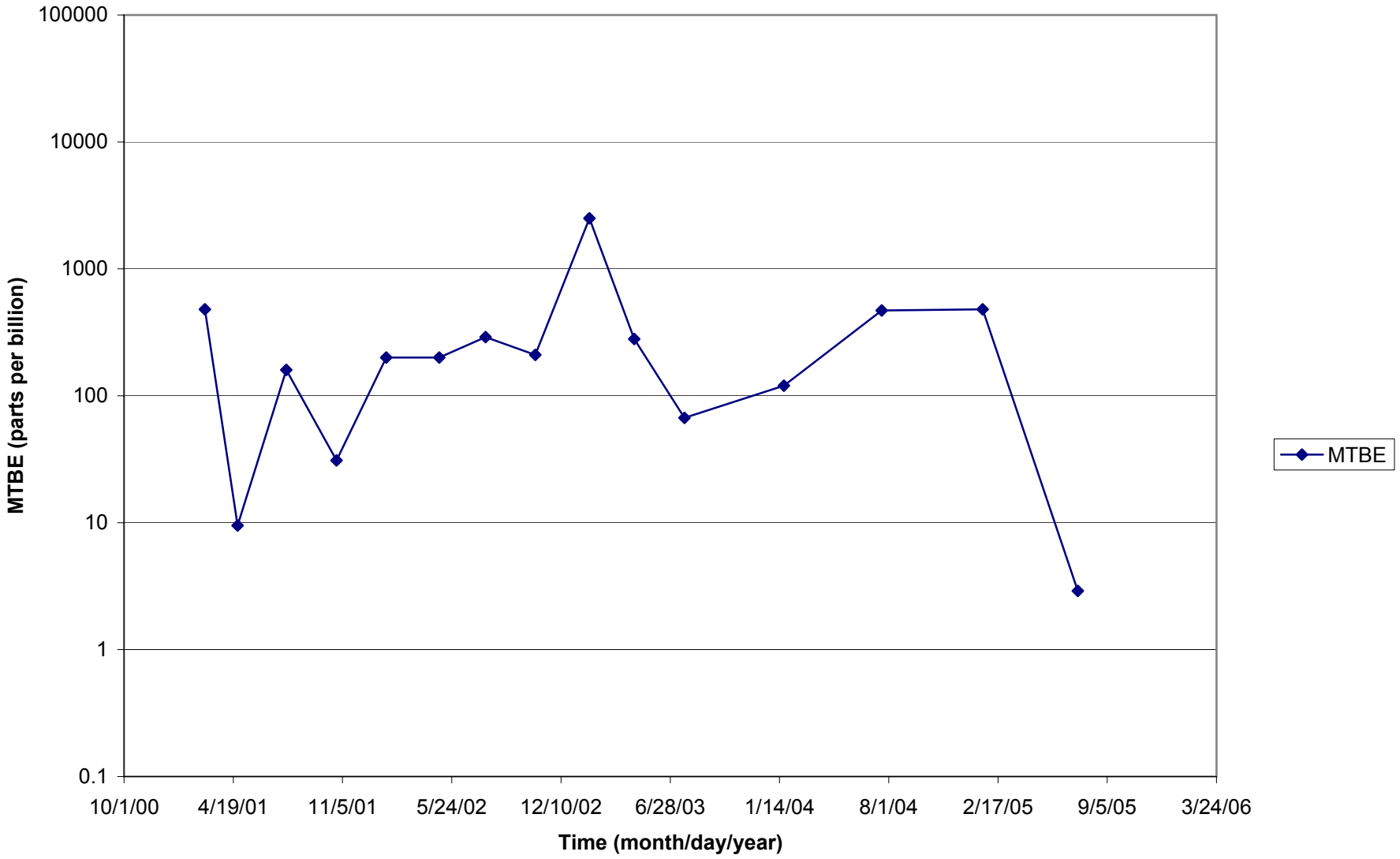
Graph 19: MW-21 at 165 Feet: TPPH (G) vs. Time - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California



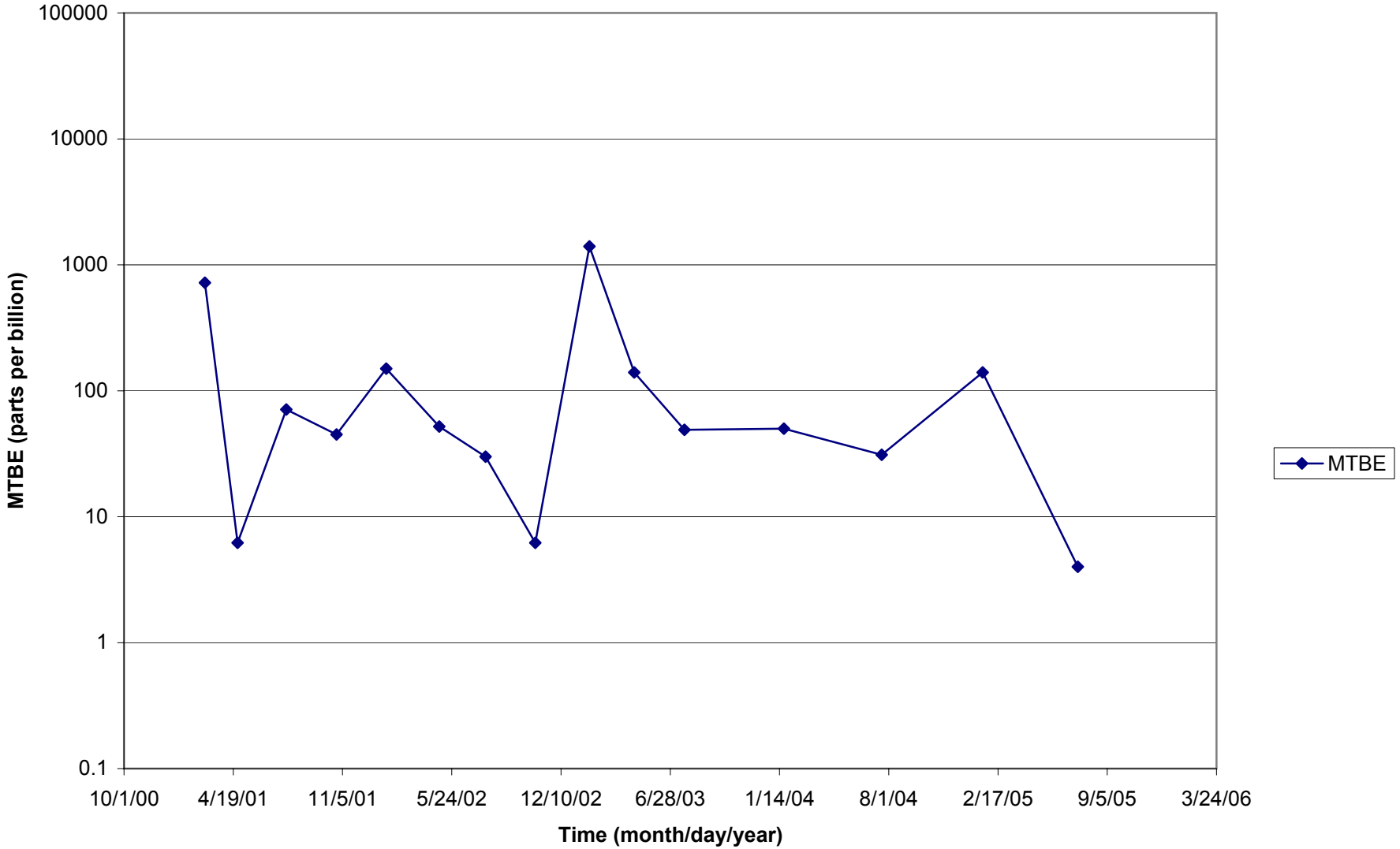
Graph 20: MW-21 at 165.5 Feet: MTBE vs. Time - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California



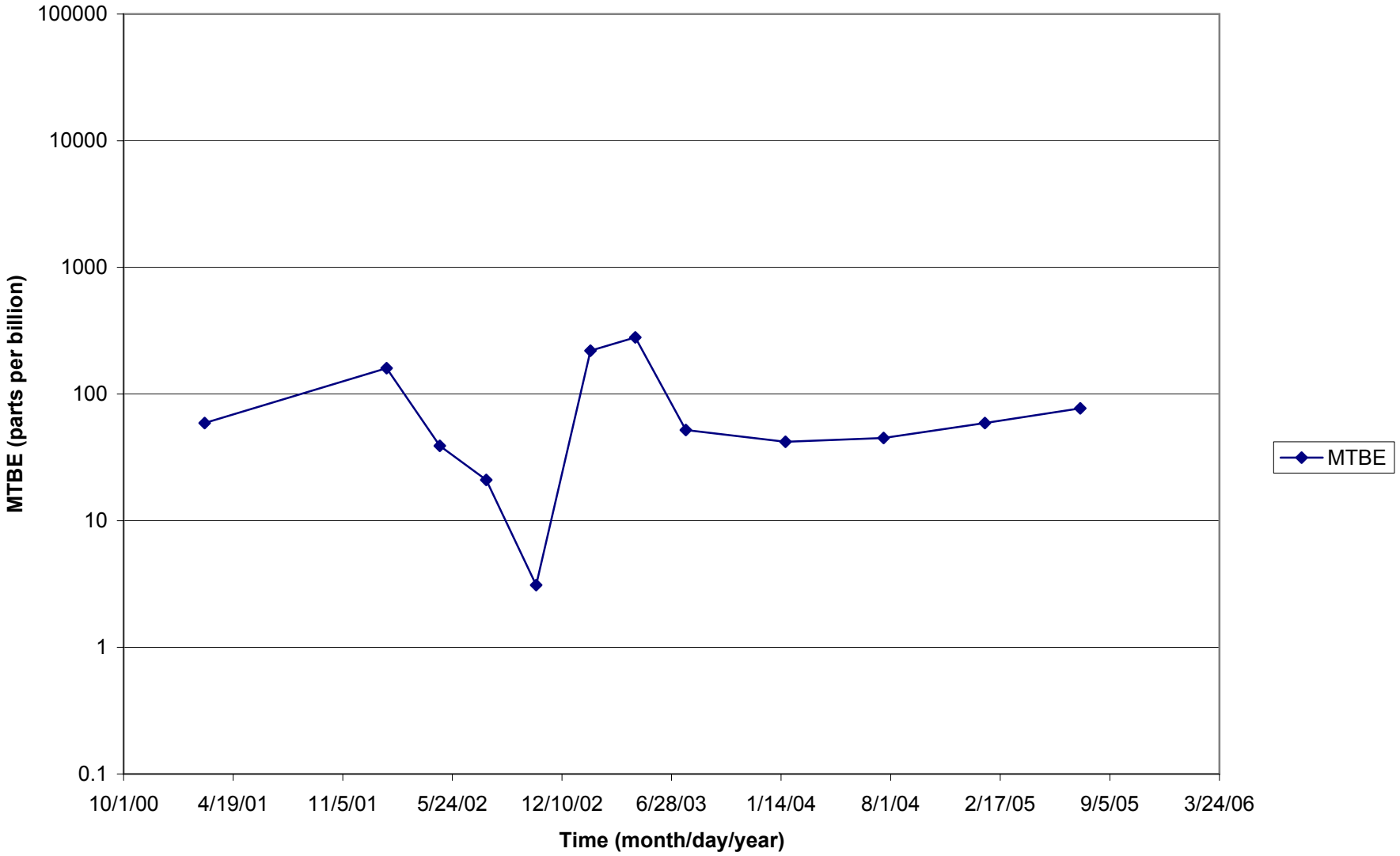
Graph 21: MW-22 at 22 Feet: MTBE vs. Time - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California



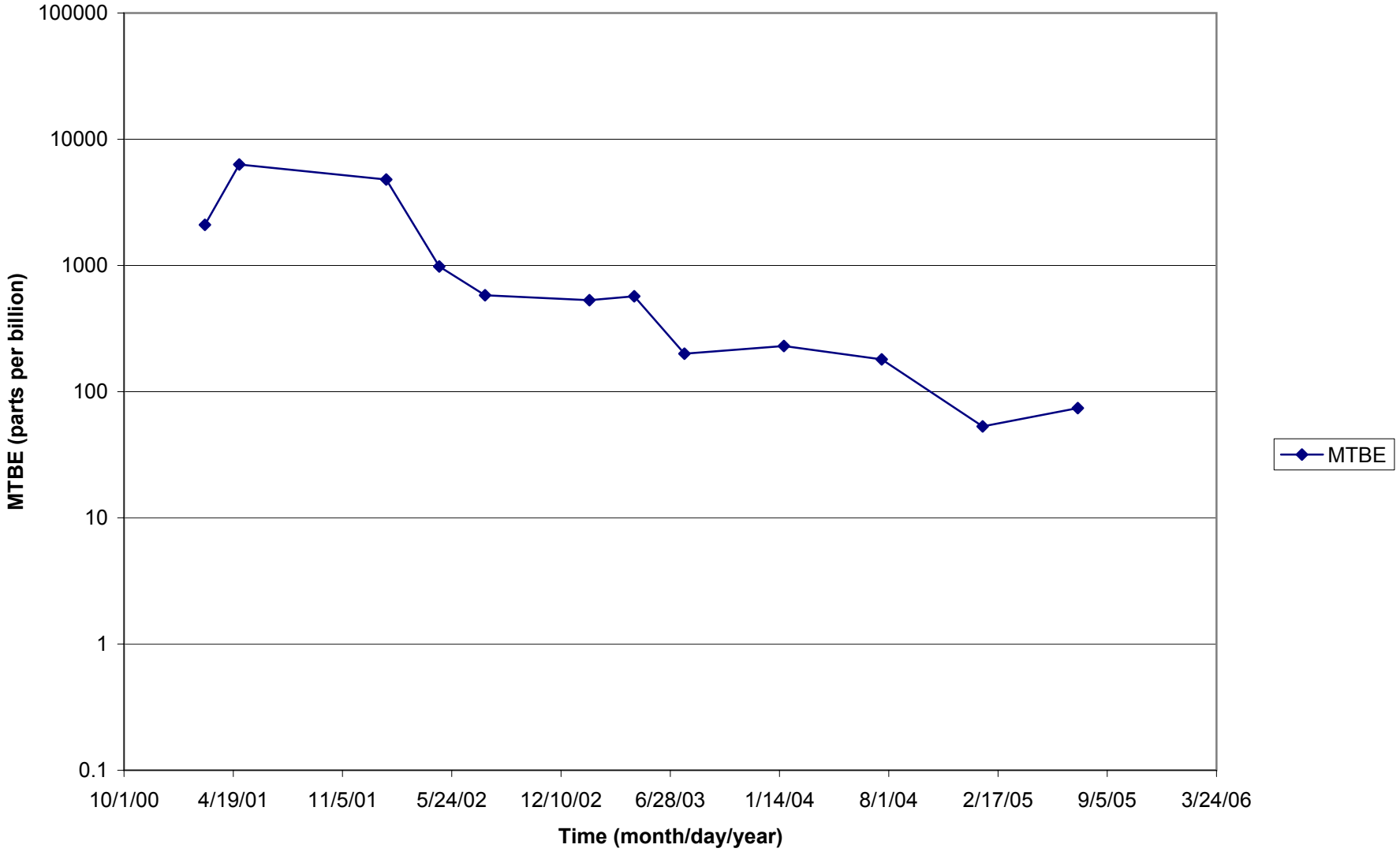
Graph 22: MW-22 at 72.5 Feet: MTBE vs Time - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California



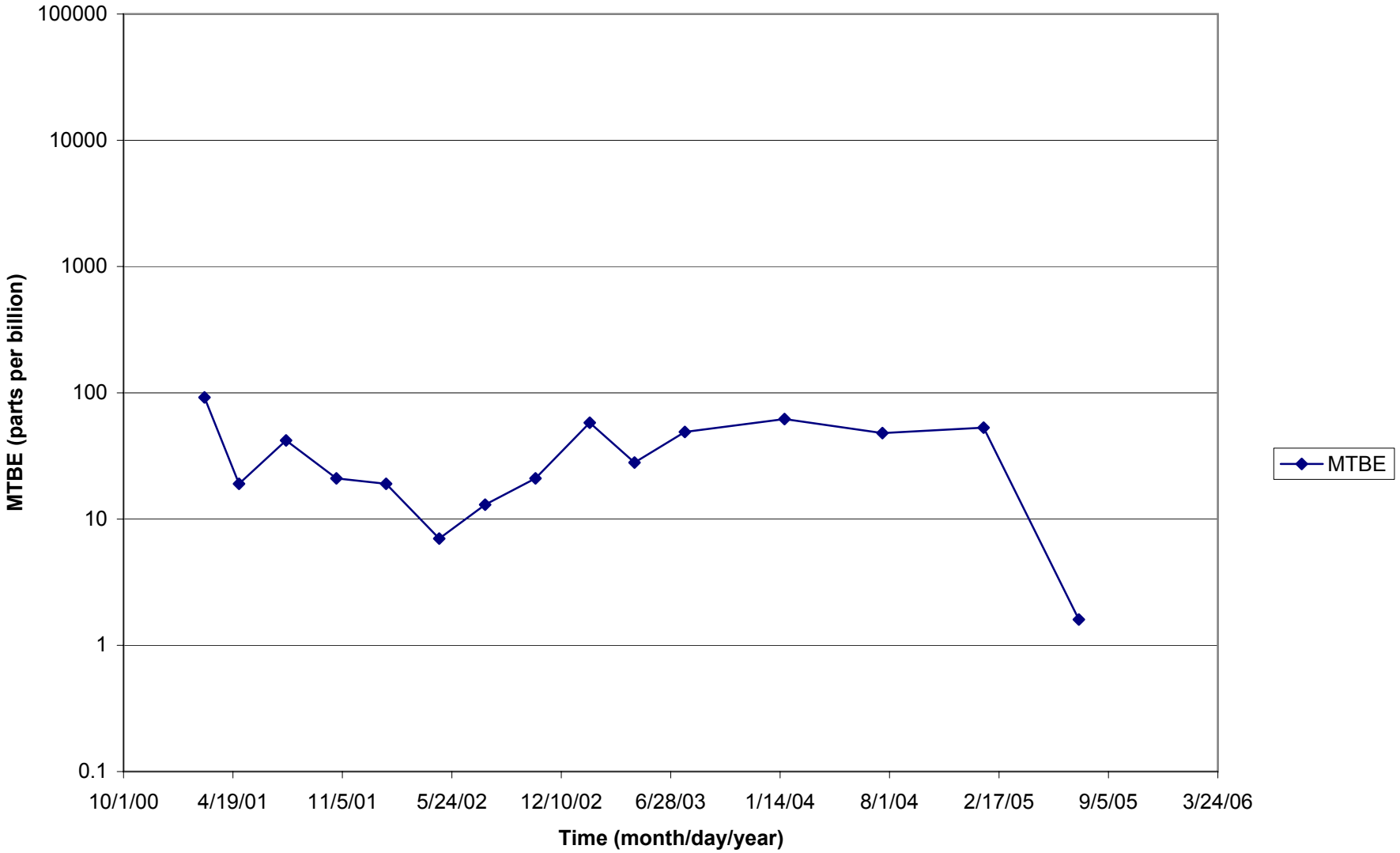
Graph 23: MW-22 at 144 Feet: MTBE vs. Time - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California



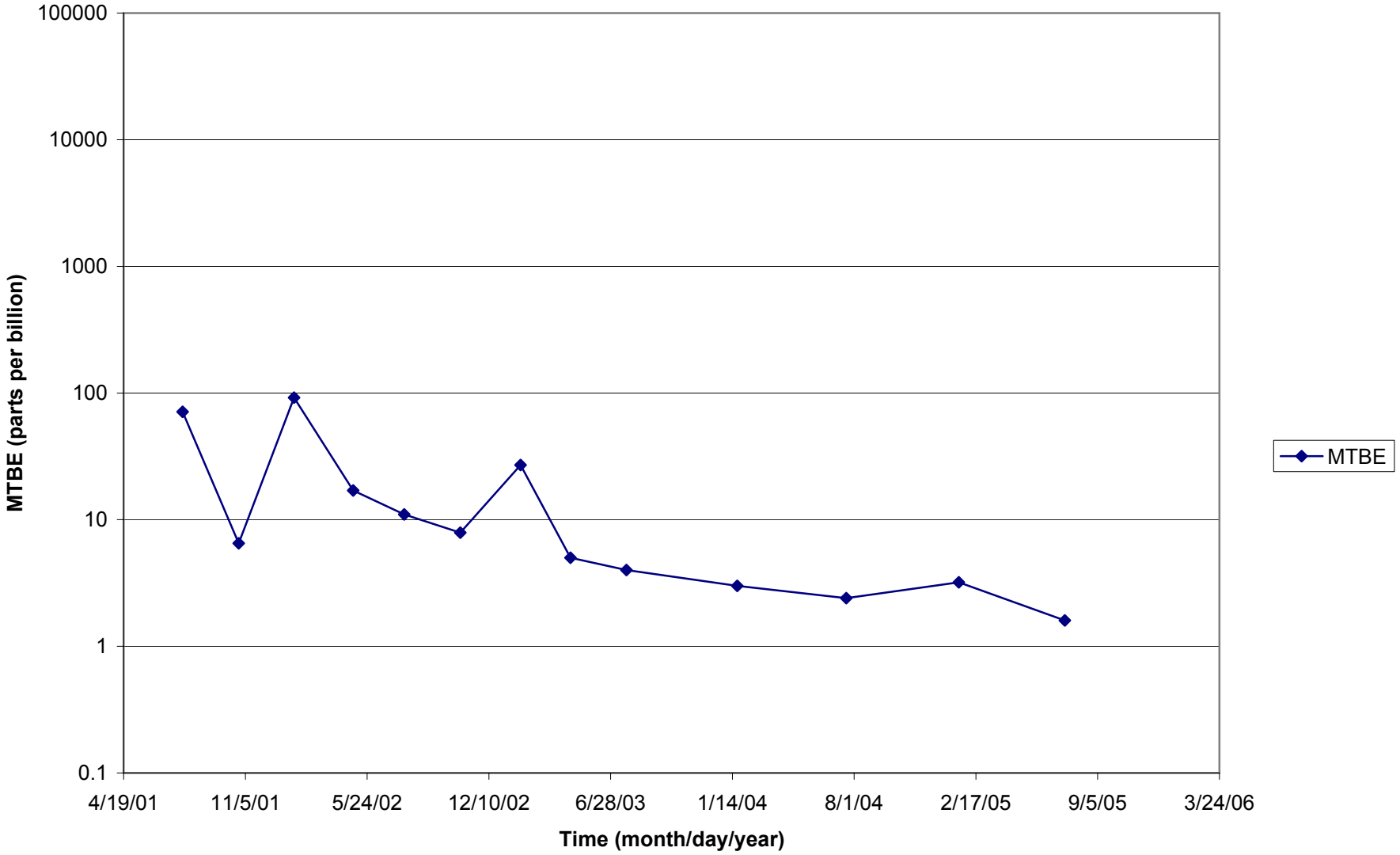
Graph 24: MW-22 at 177.5 Feet: MTBE vs. Time - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California



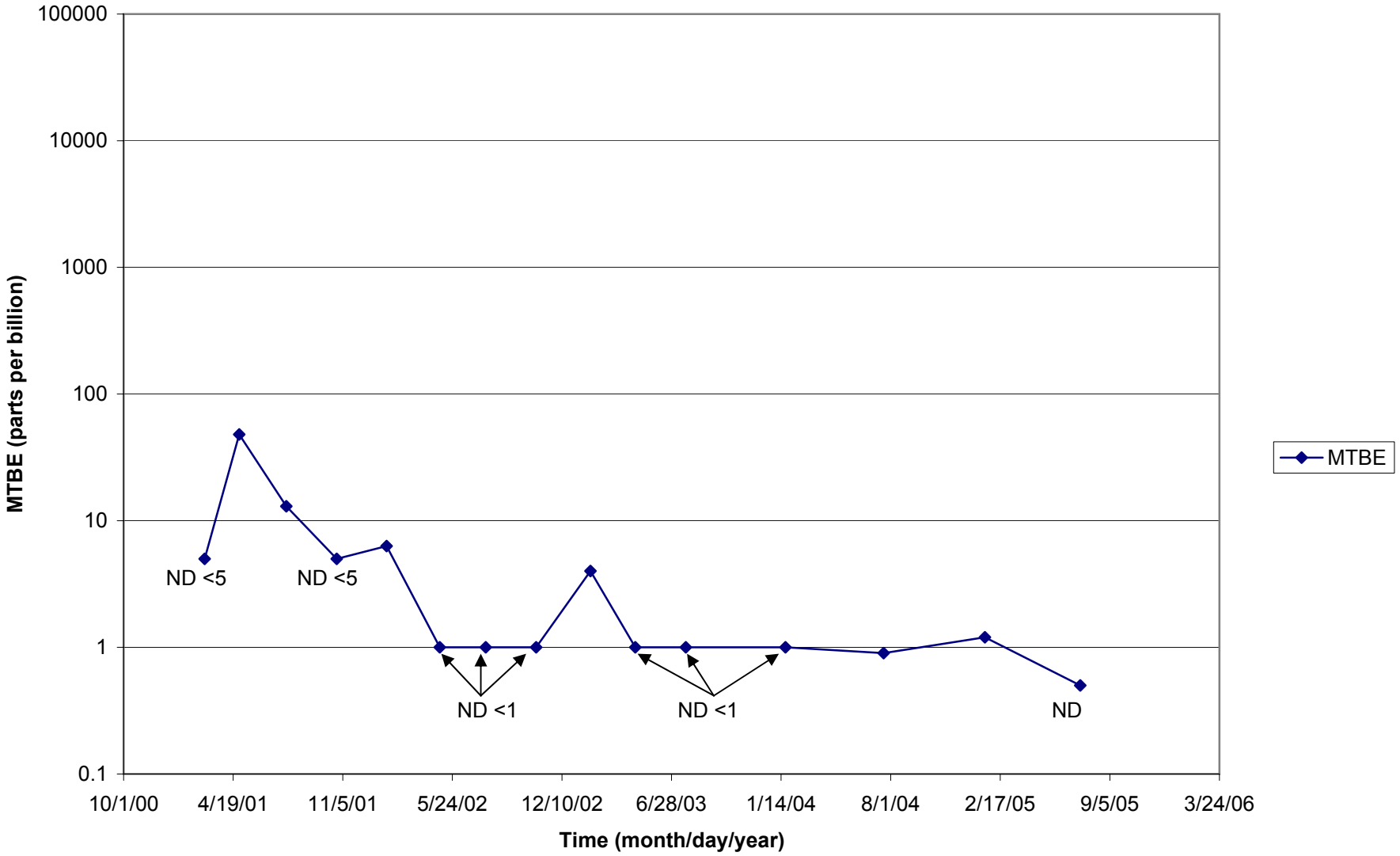
Graph 25: MW-23 at 25 Feet: MTBE vs. Time - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California



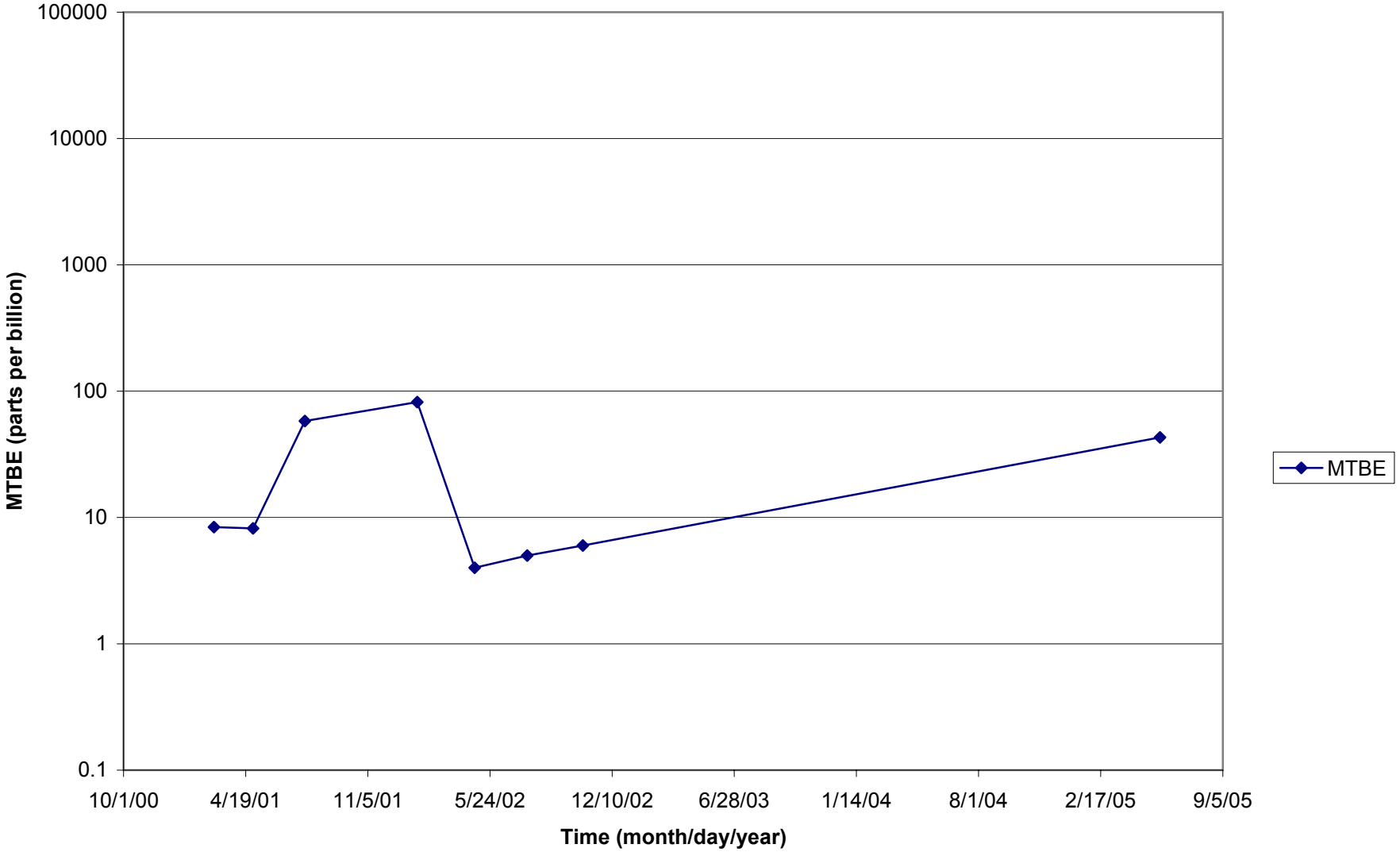
Graph 26: MW-23 at 75 Feet: MTBE vs Time - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California



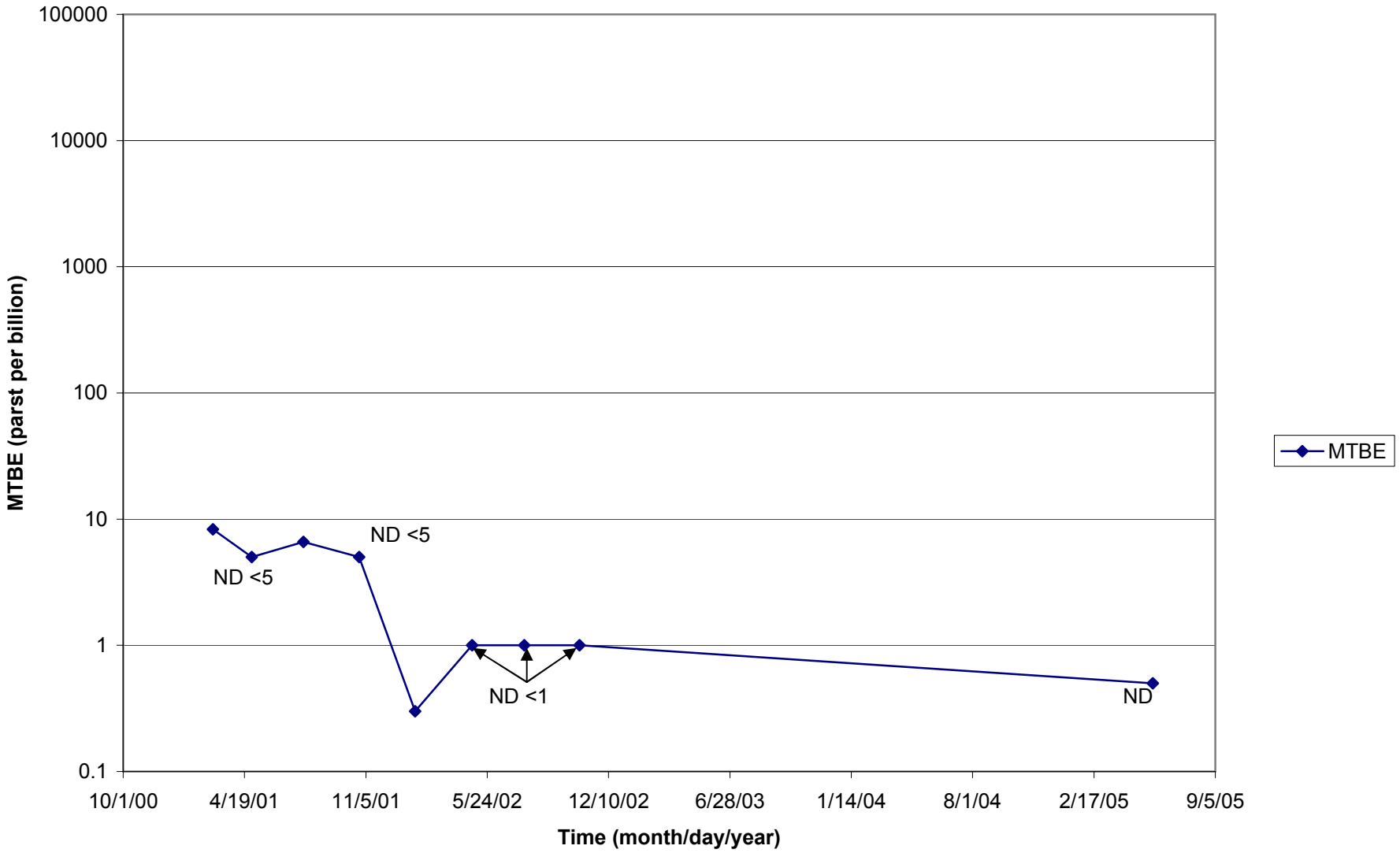
Graph 27: MW-23 at 148.5 Feet: MTBE vs. Time - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California



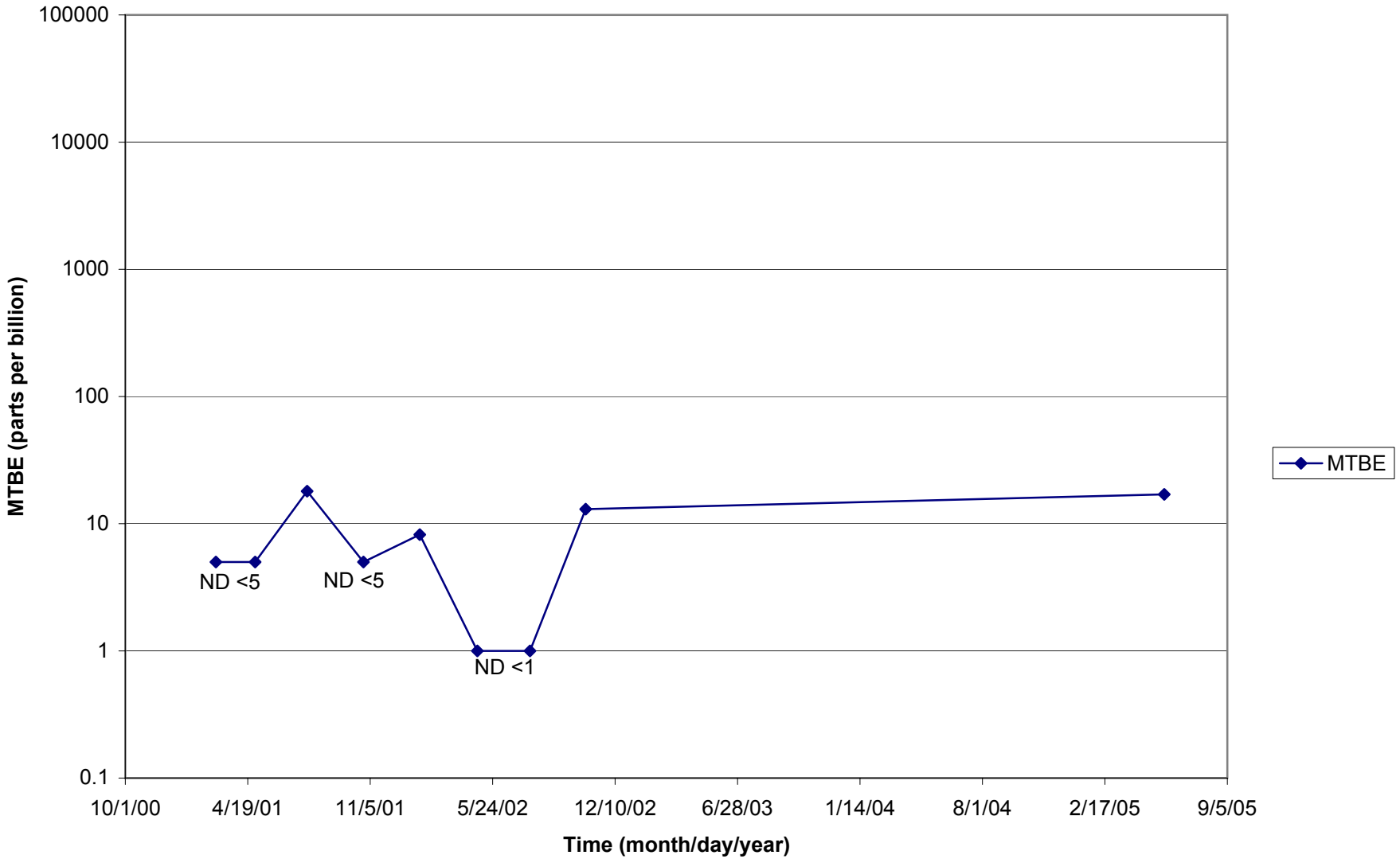
Graph 28: MW-23 at 180 Feet: MTBE vs. Time - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California



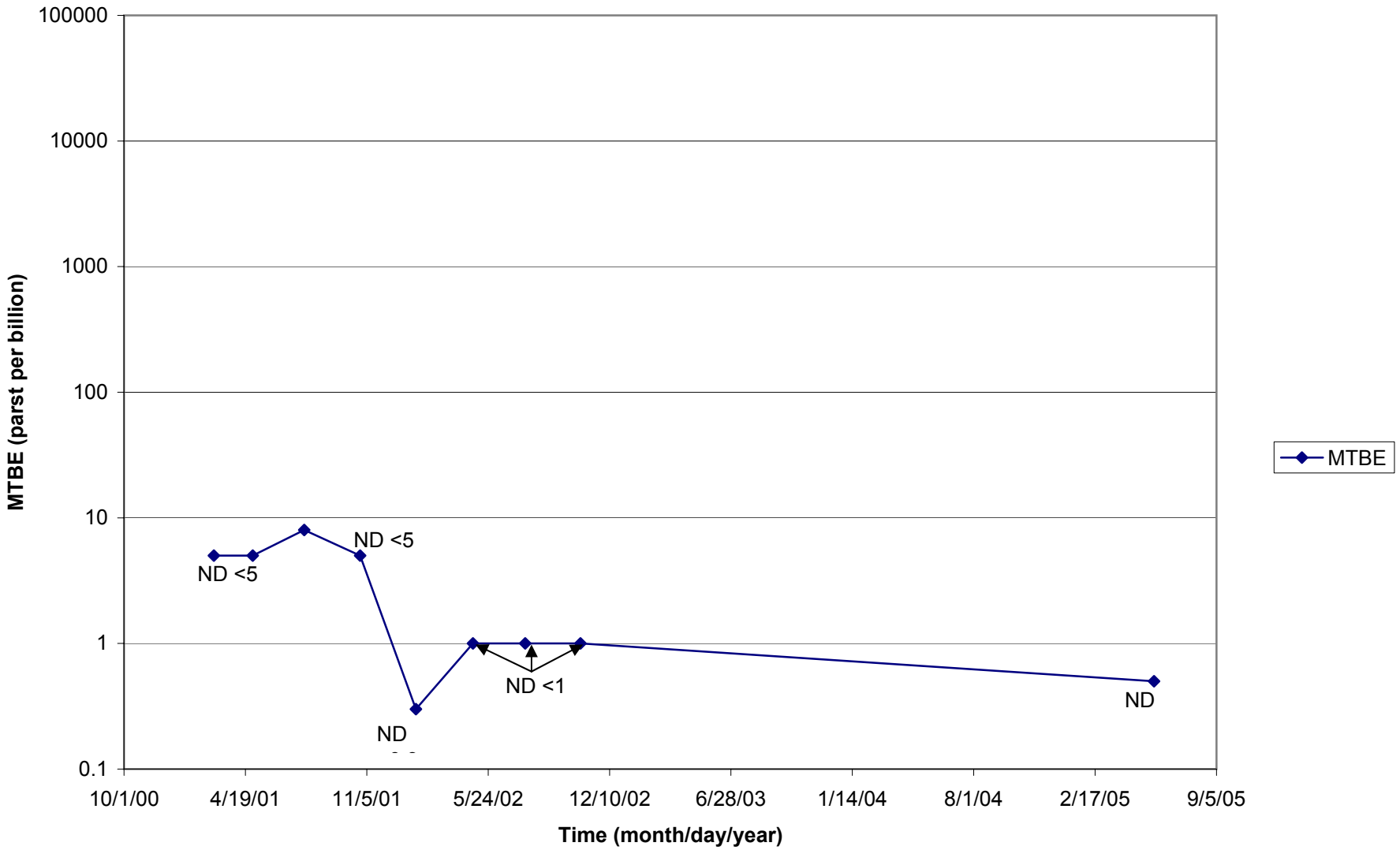
Graph 29: MW-24 at 23 Feet: MTBE vs. Time - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California



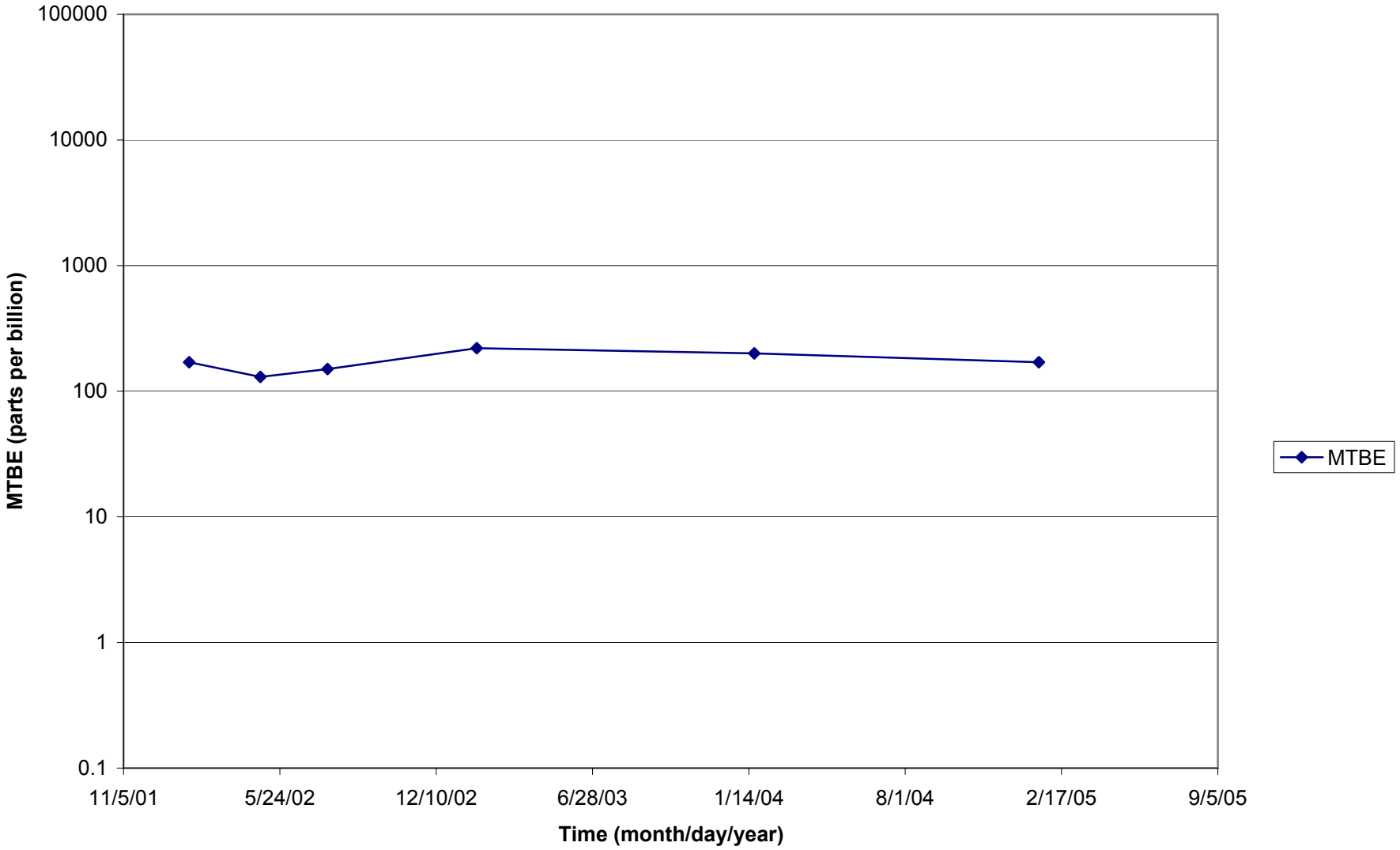
Graph 30: MW-24 at 73 Feet: MTBE vs. Time - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California



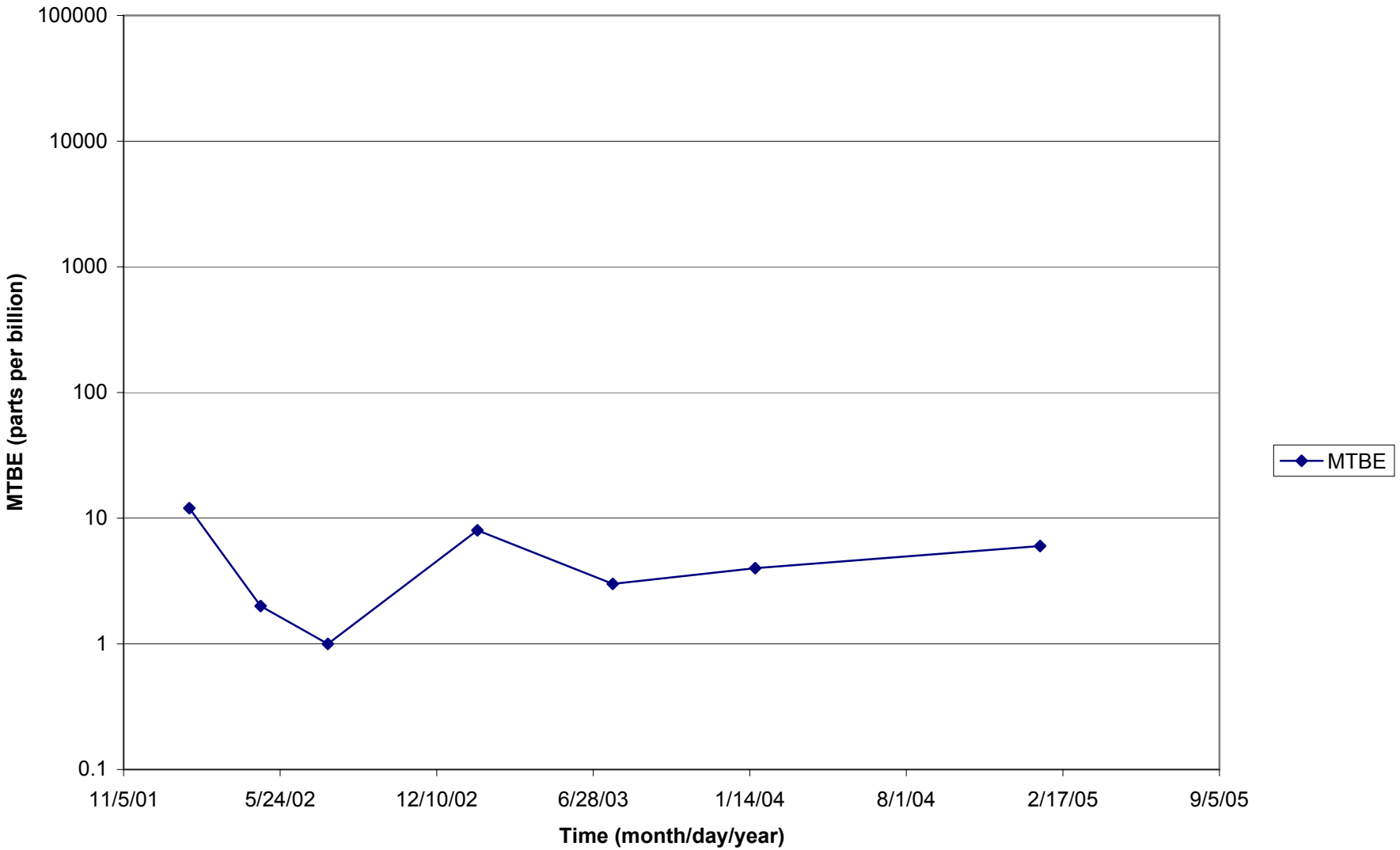
Graph 31: MW-24 at 146 Feet: MTBE vs. Time - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California



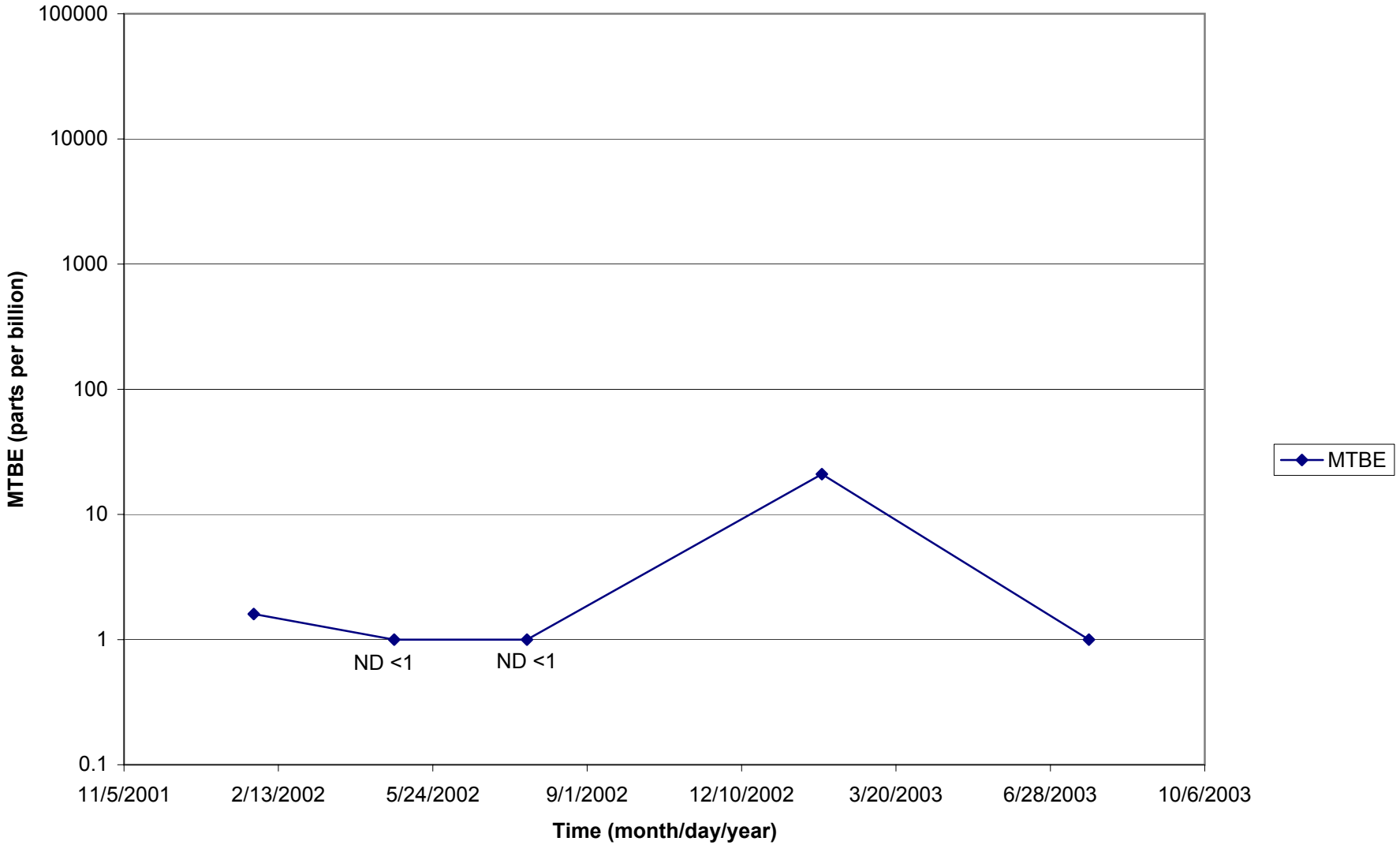
Graph 32: MW-24 at 178 Feet: MTBE vs. Time - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California



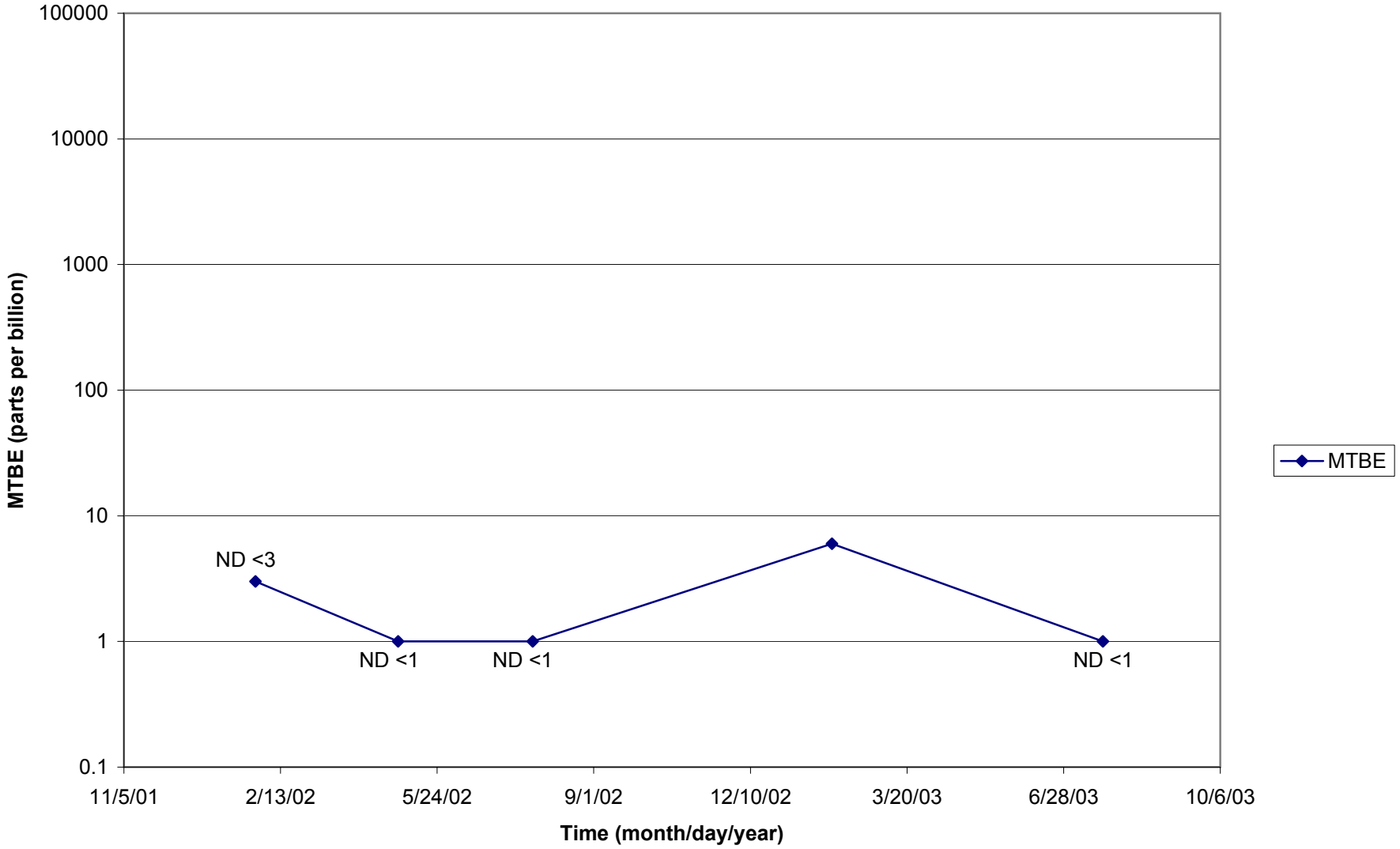
Graph 33: MW-30 at 25 Feet: MTBE vs. Time - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California



Graph 34: MW-30 at 75 Feet: MTBE vs. Time - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California



Graph 35: MW-30 at 145 Feet: MTBE vs. Time - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California



Graph 36: MW-30 at 180 Feet: MTBE vs. Time - Redwood Oil Bulk Plant, 455 Yolanda Avenue, Santa Rosa, California

APPENDIX D
MODELING RESULTS

Overview of Modeling Program

BIOSCREEN is a plume modeling program, released by the EPA, which simulates remediation through natural attentuation at petroleum fuel release sites. The software, programmed in the Microsoft Excel spreadsheet environment and based on the Domenico analytical solute transport model, has the ability to simulate natural processes such as advection, dispersion, adsorption, and aerobic decay as well as anaerobic reactions that have been shown to be the dominant biodegradation processes at many petroleum release sites.

In modeling attenuation in the vertical zones, the following simplifications and assumptions were made:

1.) It was assumed that since DW-2 has been destroyed, there is no longer a mechanism for significant vertical migration of impacted groundwater. It was assumed that impacted groundwater migrates laterally at approximately the same depth it had reached when DW-2 was deactivated. This assumption is supported by site data. Since 1999, when DW-2 was destroyed, contaminant concentrations in MW-21, the source well, have not increased. Further, the only location on the site where vertical migration of contaminants occurred was in the area adjacent to former DW-2, as evidenced by much lower concentrations in deeper sampling ports in down-gradient wells.

2.) Modeling runs were made for constituents at various depths. For the purpose of each individual modeling run, the assumption was made that there was relatively little interaction, via groundwater transport or other mechanism, with groundwater at other depths. In other words, each modeling run was treated as an isolated plume. Boring and well data indicate that there are no significant aquitards in the subsurface, and that there is some degree of connectivity between groundwater at various depths.

3.) The model assumes that groundwater migration began at a discrete time with a discrete mass of source material. In reality, the source was continuously supplied for a number of years and then was cut off in 1999. The model predicts both the rate of contaminant migration and the rate of decrease of source material. In reality, the beginning of the decrease in source material mass can be dated to 1999, but the beginning of contaminant migration began many years earlier.

4.) Estimates of soluble mass in source soil are gross estimates and were calculated only for use in the model. Insufficient data exists to make actual estimates of contaminant mass,

especially below the initial shallow zone. Therefore, estimates by the model of time required to reduce source mass should not be considered reliable.

BIOSCREEN includes three different model types:

1.) Solute transport without decay (i.e., no biodegradation).
2.) Solute transport with biodegradiation modeled as a first-order decay process. In this approach, all biodegradation mechanisms are lumped as a single parameter (the first-order decay coefficient).
3.) Solute transport with biodegradation modeled as an 'instantaneous' biodegradation reaction.

Model Type 2 (biodegradation modeled as a first-order decay process) is the more commonly used model type. Model Type 3 ('instantaneous' biodegradation model) requires extensive site-specific data which is not available at this site. For this reason, the 'instantaneous' biodegradation model was not used.

Four Model Runs are presented in this report, as follows:

1.) MTBE attenuation modeled at the 75 ft depth.
2.) BTEX attenuation modeled at the 75 ft depth.
3.) MTBE attenuation modeled at the 150 ft depth.
4.) BTEX attenuation modeled at the 150 depth.

Due to the complexity of the shallow zone (large source area with numerous pumping wells), no attempt was made to model the shallow zone.

Input parameters

For each modeling run, input parameters are shown on the attached modeling readouts. Reference texts contain typical values for soil and ground water parameters for various soil types.[14] An explanation of input values follows.

[14] 1989, Basic Ground-Water Hydrology, United States Geological Survey Water-Supply Paper 2220.

Hydrogeology Values:

Hydraulic conductivity: Estimated based on soil type. The following values were used in the model runs:

At 75 ft depth (consolidated to semi-consolidated sandstone): 2.0×10^{-5} cm/sec.
At 140 -180 ft depth (silty sands and gravels): 5.0×10^{-5} cm/sec.

Hydraulic gradient: Values based on historic sampling data. A typical value of 0.02 ft/ft was used for all models.

Porosity: Estimated based on soil type. The following values were used in the model runs: At 75 ft depth (consolidated to semi-consolidated sandstone): 0.1
At 140 -180 ft depth (silty sands and gravels): 0.25

Seepage velocity: Computed by model based on the above values.

Dispersion Values:

Estimated plume length: Taken from site data, assuming MW-21 is at the source, and the plume, extending along the center-line shown in Figure 12.

Longitudinal, transverse, and vertical dispersivity: Computed by model based on plume length.

Adsorption Values:

Retardation factor: For MTBE, a value of 1.0 was used, meaning no retardation was assumed for MTBE and that MTBE essentially moves at the speed of groundwater. For BTEX, a conservative value of 1.5 was used. Various BTEX constituents can have retardation values, based on soil type, varying from 1.5 to 14.5.[15] Both selected values are conservative, assuming a low value for retardation and a correspondingly higher mobility for the dissolved constituent in groundwater.

Biodegradation Values:

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[15] 1999, California State Water Resources Control Board, Draft Guidelines For Investigation and Cleanup of MTBE and Other Ether-Based Oxygenates, December 1, 1999.

Solute half-life/1st order decay coefficient: This is the half-life/1st order decay coefficient for the dissolved constituent in the plume. It is not the coefficient for the source. In a first-order reaction model, half-life is related to decay coefficient by the following formula: 1st order decay coefficient = 0.693/half-life. Half-life is therefore a convenient way of expressing the decay coefficient. Various published references publish typical values for decay coefficients of various compounds. In practice, half-life/1st order decay coefficient is site-specific and can vary with changing site conditions. A typical approach is to adopt a trial and error procedure to calibrate the decay coefficient to existing plume data. For BTEX, a conservative half-life value of 2.0 years was used, and this corresponded reasonably well to existing plume data. Half-life values of 5 and 10 years are shown for MTBE. These values calibrate well with field data and are conservative based on values from published studies.[16] Based on existing site data, a more precise value for the half-life/1st order decay coefficient cannot be determined.

General Values:

Modeled Area Length and Width: These variables were set in order to show the entire area of the plume.

Simulation Time: Many simulation time values were used in modeling. Additional model results are available upon request. The results displayed in this document are for simulations of 6, 20, 30, and 50 years. The 20 and 30 year model runs appear to correspond most closely with current site data. This is an expected correlation because contaminants were drawn into lower aquifers for many years before well destruction in 1999.

Source Data:

Source thickness in saturated zone: A value of 30 ft was used, based on the assumptions outlined at the beginning of this section, i.e., that contamination was drawn down by former DW-2, and that the material drawn down is now the 'source' for lateral migration of contaminants at a discrete depth.

Source width: A conservative value of plume width of 75 ft was used, based on the above assumptions.

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[16] 2002, Role of Natural Attenuation in Life Cycle of MTBE Plumes, John T. Wilson and Ravi Kolhatkar, Journal of Environmental Engineering, September 2002.

Source concentrations: Representative values were taken from Tables 5 and 6, Appendix B, for recent sampling events.

Soluble mass in source soil:

Estimates of soluble mass in source soil are gross estimates and were calculated only for use in the model. Insufficient data exists to make more precise estimates of contaminant mass below the initial shallow zone. Therefore, estimates of time required to reduce source mass as calculated by the model may not be representative of field conditions.

MTBE Mass Estimate for 75 ft depth: Since MTBE is relatively soluble in groundwater compared to hydrocarbons, and does not readily adsorb to soil, it is assumed that a large proportion of MTBE mass is dissolved in groundwater, with de minimus associated with soil.

Mass estimate of MTBE in groundwater at the approximate 75 ft depth is calculated as follows:

Assume a 75 ft diameter zone, of a thickness of 30 ft.
Cubic volume of zone is approximately 100,000 ft^3.
Volume of water in zone, with assumed porosity of 0.1, is 10,000 ft^3, or 280,000 liters.
Assuming an average concentration of 30,000 ug/l, mass of MTBE in water equals approximately 8 kg.
As a conservative measure, assuming some MTBE may be sorbed to soil and some MTBE is drawn in from outside the specified zone, the 8 kg figure is multiplied by 5, for an MTBE mass estimate of 40 kg.

Calculation of mass of BTEX in groundwater at the approximate 75 ft depth is calculated as follows:
Volume of water in zone, as calculated above: 280,000 liters
Assuming an average BTEX concentration (from January 20, 2005 data) of approximately 400 ug/l, mass of BTEX is approximately 0.1 kg. As a conservative measure, assuming most BTEX is sorbed to soil and some BTEX enters from outside the zone, the value used in the model is 5 kg.

Calculation of mass of MTBE in groundwater at the approximate 150 ft depth is calculated as follows:
Assume a 75 ft diameter zone, of a thickness of 30 ft.
Cubic volume of zone is approximately 100,000 ft^3.
Volume of water in zone, with assumed porosity of 0.25, is 25,000 ft^3, or 708,000 liters.
Assuming an average concentration of 1,000 ug/l, mass of MTBE in water equals approximately 0.7 kg.
Using the conservative assumptions as above, the value used in the model is 5 kg.

Calculation of mass of BTEX in groundwater at the approximate 150 ft depth is calculated as follows:
Volume of water in zone, as calculated above: 708,000 liters
Assuming an average BTEX concentration (from January 20, 2005 data) of approximately 225 ug/l, mass of BTEX is approximately 0.16 kg. Using the conservative assumptions as above, the value used in the model is 5 kg.

Source half-life value:
Calculated by the model.

Field data for comparisons

Representative values from recent sampling events were used.

Modeling Results

Modeling results are attached. For each modeling run, data input parameters are presented. Modeling results are shown in a three-dimensional format and a center-line format (i.e. showing expected concentrations along the center-line of the plume. Three dimensional format for model output is presented for selected parameters. Center-line format is presented for all parameter inputs.

Modeling Run 1: MTBE at 75 ft depth.

MTBE attenuation modeling results are presented for time-spans of 6 years, 20 years, and 50 years, with an assumed solute half-life for MTBE of 5 or 10 years. Representative data from MW-21, MW-22, and MW-23 was used to calibrate the model. Current data corresponds most closely with 20 year model predictions. The model supports the hypothesis that MTBE biodegradation is occurring at the site, because predicted values for the 'no degradation' model are consistently higher than current values in monitoring wells. Current values in monitoring wells correspond reasonably well with predicted values, after 20 years, for 1st order biodegradiation, with a 5 or 10 year solute half-life value for MTBE. The 50 year model can be considered a predictor of conditions 20 to 30 years in the future. The 50-year model predicts decrease of MTBE concentrations in the source zone, with slightly elevated concentrations at a distance of 150 to 300 ft from the site. Overall plume size and length predicted by the 50-year model is slightly longer than current plume length.

Modeling Run 2: BTEX at 75 ft depth.

BTEX attenuation modeling results are presented for time-spans of 6 years, 20 years, and 50 years, with an assumed half-life for BTEX of 2 years. The model predicts gradually declining source concentrations with no additional plume expansion.

Modeling Run 3: MTBE at 150 ft depth

MTBE attenuation modeling results for the 150 ft depth are presented for time-spans of 6 years, 20 years, 30 years, and 50 years, with an assumed solute half-life for MTBE or 5 or 10 years. Representative data from MW-21, MW-22, and MW-23 was used to calibrate the model. Current data corresponds most closely with 20 and 30-year model predictions. The no-degradation model predicts higher-than-actual values for MW-22. The 50 year model can be considered a predictor of conditions 20 to 30 years in the future. The model shows no significant plume expansion.

Modeling Run 4: BTEX at 150 ft depth.

BTEX attenuation modeling results for 150 ft are presented for time-spans of 6 years, 20 years, and 50 years, with an assumed half-life for BTEX of 2 years. The model predicts gradually declining plume concentrations and a gradually declining plume.

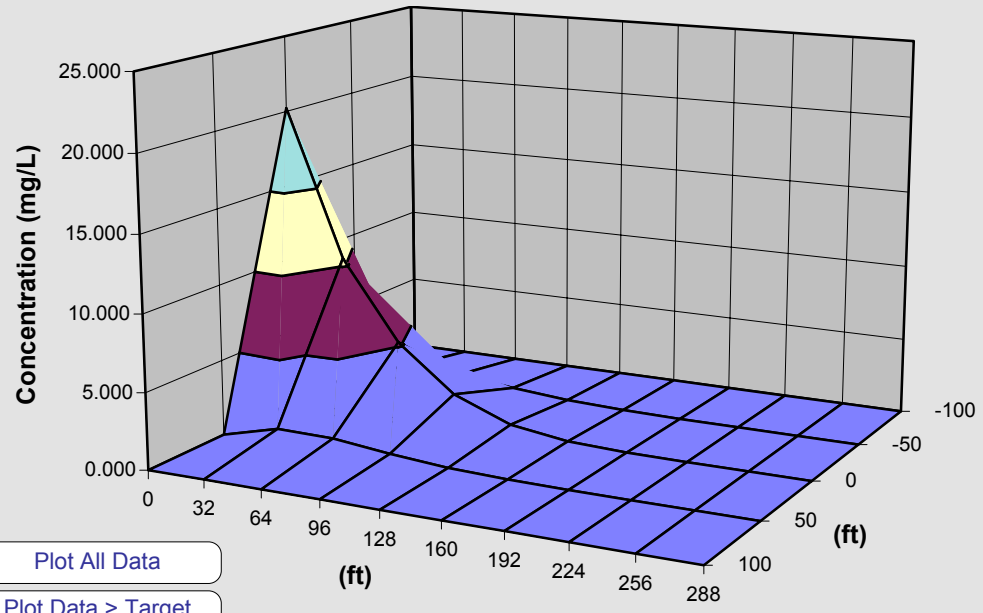
Modeling Run 1:
20 Year MTBE Simulation, Assuming a 5 Year Half-Life for MTBE
Redwood Oil Bulk Plant, 455 Yolanda, Santa Rosa, CA

DISSOLVED HYDROCARBON CONCENTRATIONS IN PLUME (mg/L at Z=0)

Transverse Distance (ft)	Distance from Source (ft)										
	0	32	64	96	128	160	192	224	256	288	320
100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
50	0.000	0.965	0.914	0.499	0.187	0.052	0.010	0.001	0.000	0.000	0.000
0	20.205	10.480	5.231	2.204	0.705	0.174	0.031	0.004	0.000	0.000	0.000
-50	0.000	0.965	0.914	0.499	0.187	0.052	0.010	0.001	0.000	0.000	0.000
-100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MASS FLUX (mg/day)	2.2E+3	6.0E+2	3.4E+2	1.5E+2	5.2E+1	1.3E+1	2.5E+0	3.2E-1	2.8E-2	1.6E-3	6.3E-5

Model to Display:
- No Degradation Model
- 1st Order Decay Model
- Instantaneous Reaction Model

Time: **20 Years** Target Level: **0.005** mg/L Displayed Model: **1st Order Decay**



Plot All Data
Plot Data > Target

Plume and Source Masses (Order-of-Magnitude Accuracy)

Plume Mass if No Biodegradation	13.1	(Kg)
- Actual Plume Mass	5.2	(Kg)
= Plume Mass Removed by Biodeg	**7.8**	(Kg)
	(60 %)	

Change in Electron Acceptor/Byproduct Masses:

Oxygen	Nitrate	Iron II	Sulfate	Methane	
na	na	na	na	na	(Kg)

Contam. Mass in Source (t=0 Years)	40.0	(Kg)
Contam. Mass in Source Now (t=20Years)	26.9	(Kg)
Current Volume of Groundwater in Plume	2.1	(ac-ft)
Flowrate of Water Through Source Zone	0.021	(ac-ft/yr)

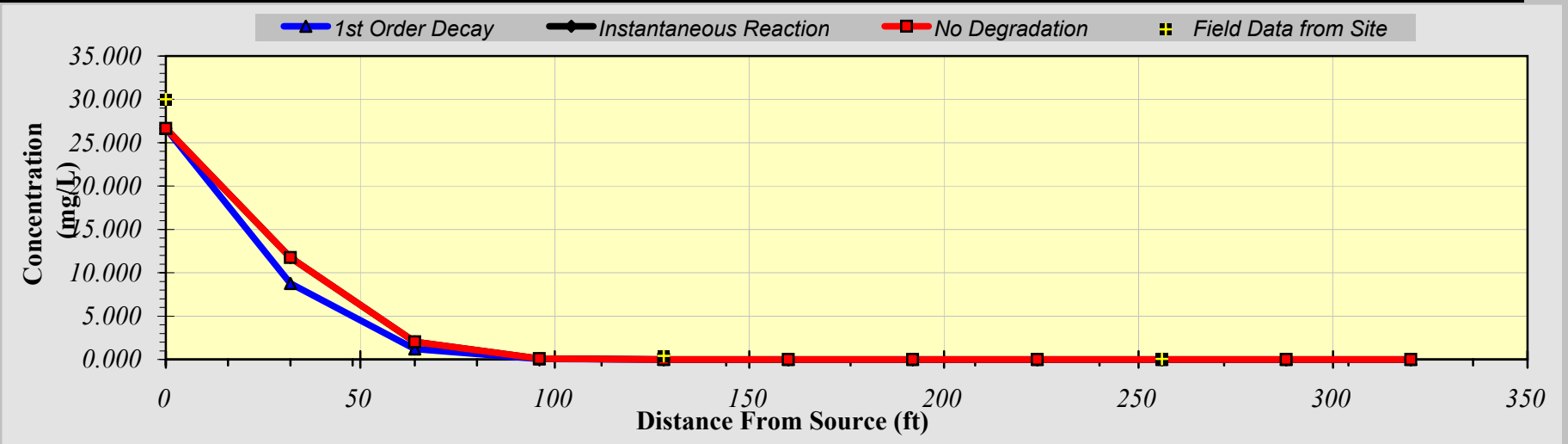
Mass HELP
Recalculate

Modeling Run 1:
6-year MTBE Simulation at 75 ft depth, Assuming a 5 Year half-life for MTBE;
Redwood Oil Bulk Plant, 455 Yolanda, Santa Rosa, CA

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	32	64	96	128	160	192	224	256	288	320
No Degradation	26.645	11.767	2.018	0.097	0.001	0.000	0.000	0.000	0.000	0.000	0.000
1st Order Decay	26.645	8.759	1.214	0.053	0.001	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	26.645	11.767	2.018	0.097	0.001	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site	30.000				0.400				0.050		



Calculate Animation

Time: 6 Years

Return to Input

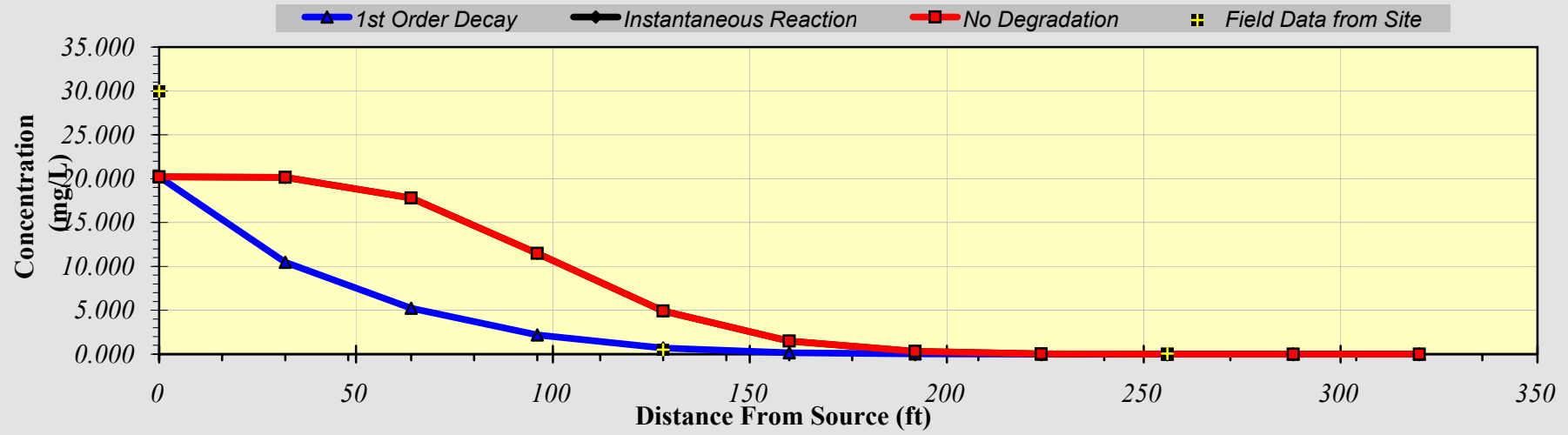
Recalculate This Sheet

Modeling Run 1:
20-year MTBE Simulation at 75 ft depth, Assuming a 5 Year half-life for MTBE;
Redwood Oil Bulk Plant, 455 Yolanda, Santa Rosa, CA

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	32	64	96	128	160	192	224	256	288	320
No Degradation	20.205	20.140	17.811	11.483	4.931	1.480	0.302	0.041	0.004	0.000	0.000
1st Order Decay	20.205	10.480	5.231	2.204	0.705	0.174	0.031	0.004	0.000	0.000	0.000
Inst. Reaction	20.205	20.140	17.811	11.483	4.931	1.480	0.302	0.041	0.004	0.000	0.000
Field Data from Site	30.000				0.500				0.050		



Calculate Animation

Time: 20 Years

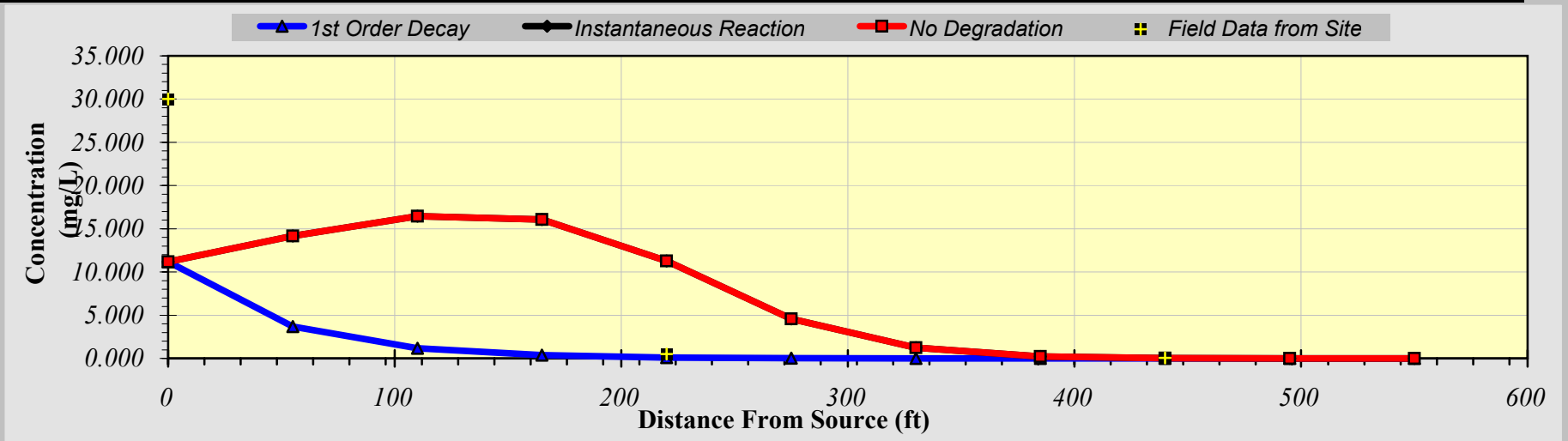
Return to Input

Recalculate This Sheet

Modeling Run 1:
50-year MTBE Simulation at 75 ft depth, Assuming a 5 Year half-life for MTBE;
Redwood Oil Bulk Plant, 455 Yolanda, Santa Rosa, CA

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

	Distance from Source (ft)										
TYPE OF MODEL	0	55	110	165	220	275	330	385	440	495	550
No Degradation	11.167	14.163	16.455	16.057	11.279	4.564	1.224	0.209	0.022	0.001	0.000
1st Order Decay	11.167	3.682	1.180	0.368	0.104	0.022	0.004	0.000	0.000	0.000	0.000
Inst. Reaction	11.167	14.163	16.455	16.057	11.279	4.564	1.224	0.209	0.022	0.001	0.000
Field Data from Site	30.000				0.500				0.050		



Calculate Animation

Time: 50 Years

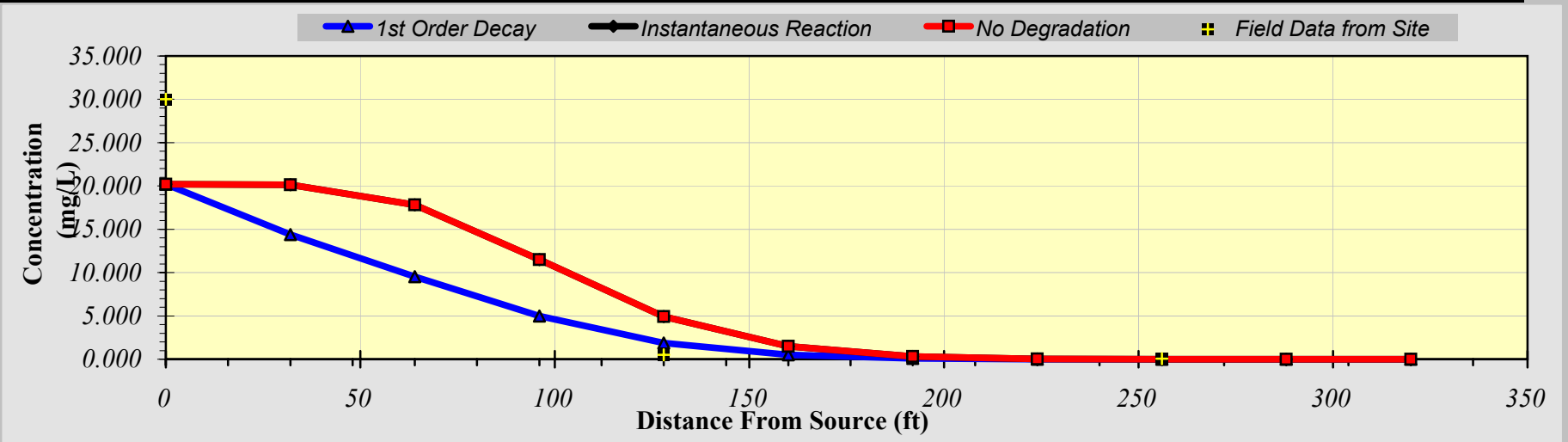
Return to Input

Recalculate This Sheet

Modeling Run 1:
20-year MTBE Simulation at 75 ft depth, Assuming a 10 Year half-life for MTBE;
Redwood Oil Bulk Plant, 455 Yolanda, Santa Rosa, CA

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

	Distance from Source (ft)										
TYPE OF MODEL	0	32	64	96	128	160	192	224	256	288	320
No Degradation	20.205	20.140	17.811	11.483	4.931	1.480	0.302	0.041	0.004	0.000	0.000
1st Order Decay	20.205	14.402	9.525	4.992	1.864	0.509	0.098	0.013	0.001	0.000	0.000
Inst. Reaction	20.205	20.140	17.811	11.483	4.931	1.480	0.302	0.041	0.004	0.000	0.000
Field Data from Site	30.000				0.500				0.050		



Calculate Animation

Time: 20 Years

Return to Input

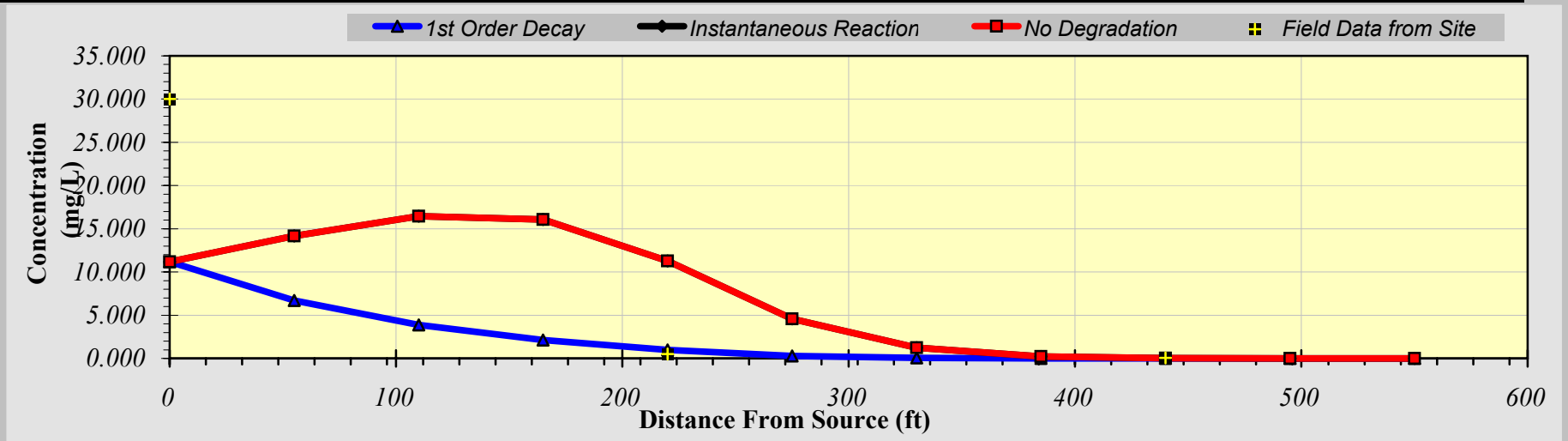
Recalculate This Sheet

Modeling Run 1:
50-year MTBE Simulation at 75 ft depth, Assuming a 10 Year half-life for MTBE;
Redwood Oil Bulk Plant, 455 Yolanda, Santa Rosa, CA

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	55	110	165	220	275	330	385	440	495	550
No Degradation	11.167	14.163	16.455	16.057	11.279	4.564	1.224	0.209	0.022	0.001	0.000
1st Order Decay	11.167	6.692	3.873	2.117	0.972	0.296	0.066	0.010	0.001	0.000	0.000
Inst. Reaction	11.167	14.163	16.455	16.057	11.279	4.564	1.224	0.209	0.022	0.001	0.000
Field Data from Site	30.000				0.500				0.050		



Calculate Animation

Time: 50 Years

Return to Input

Recalculate This Sheet

Modeling Run 2:
BTEX Simulation at 75 ft depth
Redwood Oil Bulk Plant, 455 Yolanda, Santa Rosa, CA

BIOSCREEN Natural Attenuation Decision Support System

Air Force Center for Environmental Excellence — *Version 1.4*

Yolanda 75 ft
BTEX
Run Name

Data Input Instructions:

115 — *1. Enter value directly....or*
↑ or — *2. Calculate by filling in grey*
0.02 — *cells below. (To restore formulas, hit button below).*

Variable* — *Data used directly in model.*
20 — *Value calculated by model.*
(Don't enter any data).

1. HYDROGEOLOGY

Seepage Velocity*	*Vs*	4.1	*(ft/yr)*
or		↑ or	
Hydraulic Conductivity	*K*	2.0E-05	*(cm/sec)*
Hydraulic Gradient	*i*	0.02	*(ft/ft)*
Porosity	*n*	0.1	*(-)*

2. DISPERSION

Longitudinal Dispersivity	*alpha x*	13.8	*(ft)*
Transverse Dispersivity*	*alpha y*	1.4	*(ft)*
Vertical Dispersivity*	*alpha z*	0.0	*(ft)*
or		↑ or	
Estimated Plume Length	*Lp*	300	*(ft)*

3. ADSORPTION

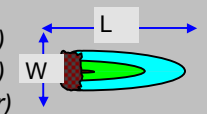
Retardation Factor*	*R*	1.5	*(-)*
or		↑ or	
Soil Bulk Density	*rho*		*(kg/l)*
Partition Coefficient	*Koc*		*(L/kg)*
FractionOrganicCarbon	*foc*		*(-)*

4. BIODEGRADATION

1st Order Decay Coeff*	*lambda*	3.5E-1	*(per yr)*
or		↑ or	
Solute Half-Life	*t-half*	2.00	*(year)*
or Instantaneous Reaction Mode			
Delta Oxygen*	*DO*		*(mg/L)*
Delta Nitrate*	*NO3*		*(mg/L)*
Observed Ferrous Iron*	*Fe2+*		*(mg/L)*
Delta Sulfate*	*SO4*		*(mg/L)*
Observed Methane*	*CH4*		*(mg/L)*

5. GENERAL

Modeled Area Length*	350	*(ft)*
Modeled Area Width*	200	*(ft)*
Simulation Time*	20	*(yr)*



6. SOURCE DATA

Source Thickness in Sat.Zone* 30 *(ft)*

Source Zones:

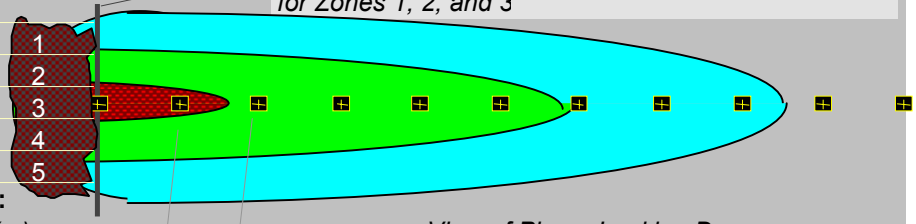
	Width* (ft)	Conc. (mg/L)*
1		
2		
3	75	0.4
4	0	0
5	0	0

Source Halflife (see Help):

300	300	*(yr)*
Inst. React. ↑	↑ 1st Order	

Soluble Mass 5 *(Kg)*
In Source NAPL, Soil

Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3



View of Plume Looking Down

Observed Centerline Concentrations at Monitoring Wells
If No Data Leave Blank or Enter "0"

7. FIELD DATA FOR COMPARISON

Concentration (mg/L)	.4				.0						
Dist. from Source (ft)	0	35	70	105	140	175	210	245	280	315	350

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE — **View Output**

RUN ARRAY — **View Output**

Help

Recalculate This Sheet

Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

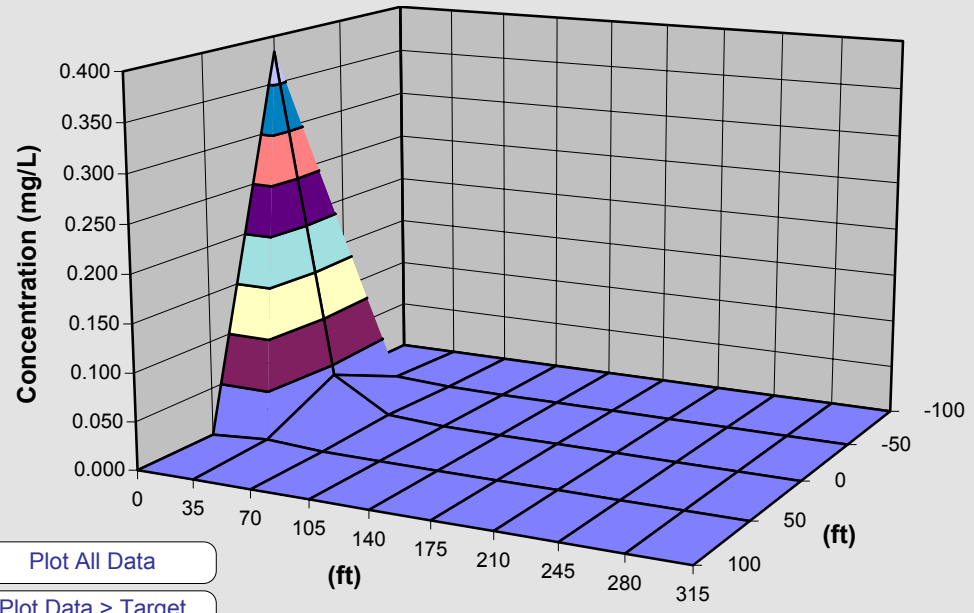
Modeling Run 2:
20-year BTEX simulation at 75 ft depth, assuming a 2-year half-life for BTEX;
Redwood Oil Bulk Plant, 455 Yolanda, Santa Rosa, CA

DISSOLVED HYDROCARBON CONCENTRATIONS IN PLUME (mg/L at Z=0)

Transverse Distance (ft)	Distance from Source (ft)										
	0	35	70	105	140	175	210	245	280	315	350
100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
50	0.000	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0	0.383	0.039	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-50	0.000	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MASS FLUX (mg/day)	2.9E+1	2.3E+0	2.6E-1	2.5E-2	1.9E-3	8.9E-5	2.4E-6	3.2E-8	2.1E-10	6.6E-13	9.6E-16

Model to Display:
- No Degradation Model
- 1st Order Decay Model
- Instantaneous Reaction Model

Time: **20 Years** Target Level: **0.005** mg/L Displayed Model: **1st Order Decay**



Plot All Data
Plot Data > Target

Plume and Source Masses (Order-of-Magnitude Accuracy)

Plume Mass if No Biodegradation	0.2	(Kg)
- Actual Plume Mass	0.0	(Kg)
= Plume Mass Removed by Biodeg	**0.2**	(Kg)
	(79 %)	

Change in Electron Acceptor/Byproduct Masses:

Oxygen	Nitrate	Iron II	Sulfate	Methane	
na	na	na	na	na	(Kg)

Contam. Mass in Source (t=0 Years)	5.0	(Kg)
Contam. Mass in Source Now (t=20Years)	4.8	(Kg)
Current Volume of Groundwater in Plume	0.2	(ac-ft)
Flowrate of Water Through Source Zone	0.021	(ac-ft/yr)

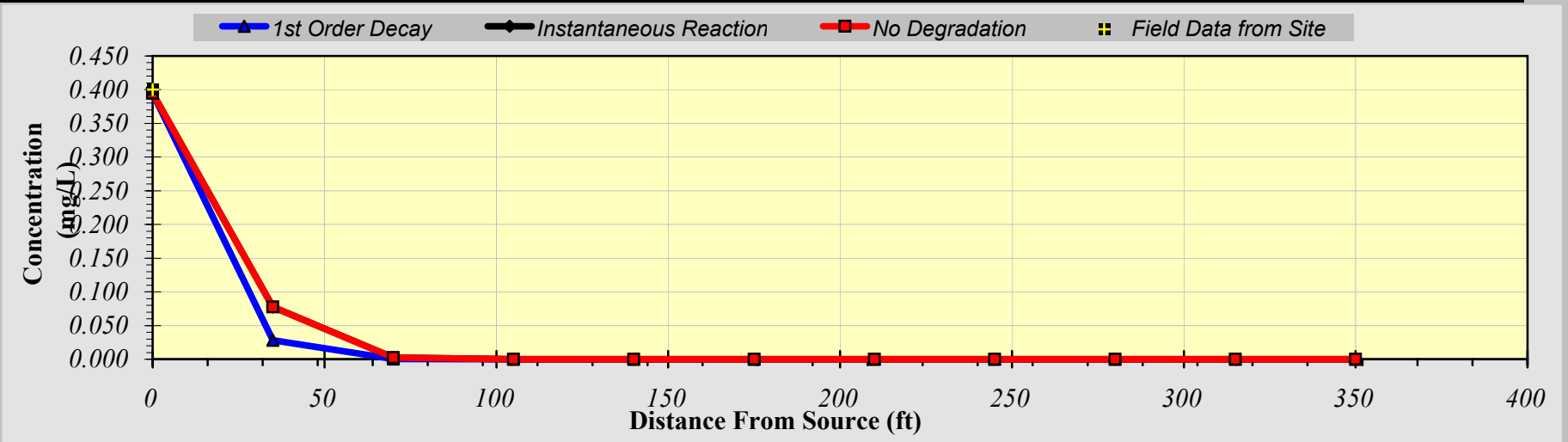
Mass HELP
Recalculate

Modeling Run 2:
6-year BTEX simulation at 75 ft depth, assuming a 2-year half-life for BTEX;
Redwood Oil Bulk Plant, 455 Yolanda, Santa Rosa, CA

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	35	70	105	140	175	210	245	280	315	350
No Degradation	0.395	0.078	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1st Order Decay	0.395	0.028	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.395	0.078	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site	0.400				0.000						



Calculate Animation

Time: 6 Years

Return to Input

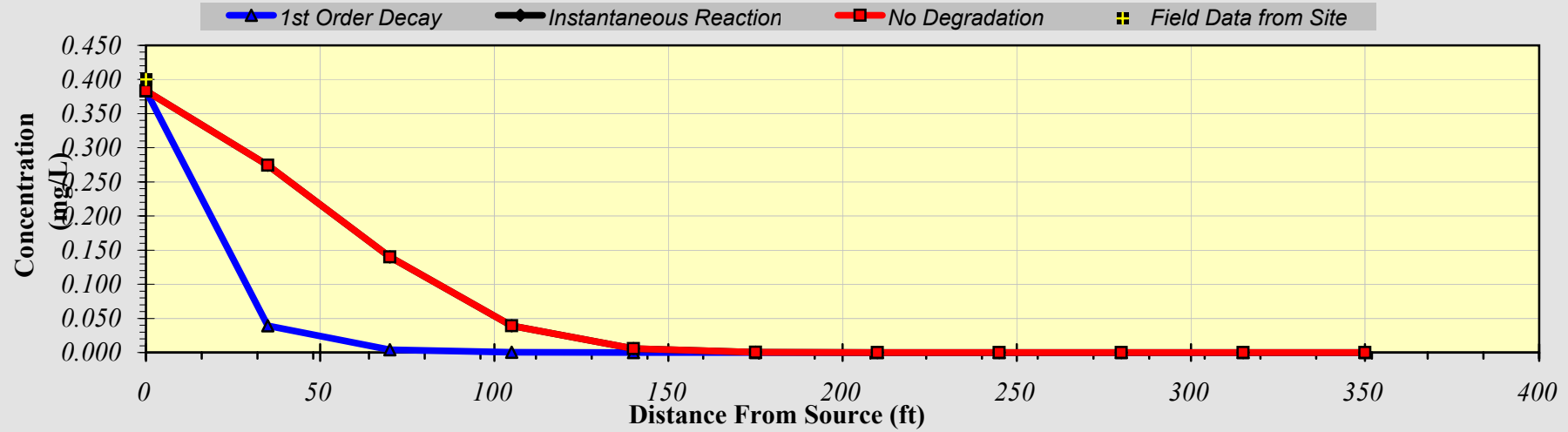
Recalculate This Sheet

Modeling Run 2:
20-year BTEX simulation at 75 ft depth, assuming a 2-year half-life for BTEX;
Redwood Oil Bulk Plant, 455 Yolanda, Santa Rosa, CA

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	35	70	105	140	175	210	245	280	315	350
No Degradation	0.383	0.275	0.140	0.039	0.006	0.000	0.000	0.000	0.000	0.000	0.000
1st Order Decay	0.383	0.039	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.383	0.275	0.140	0.039	0.006	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site	0.400				0.000						



Calculate Animation

Time: 20 Years

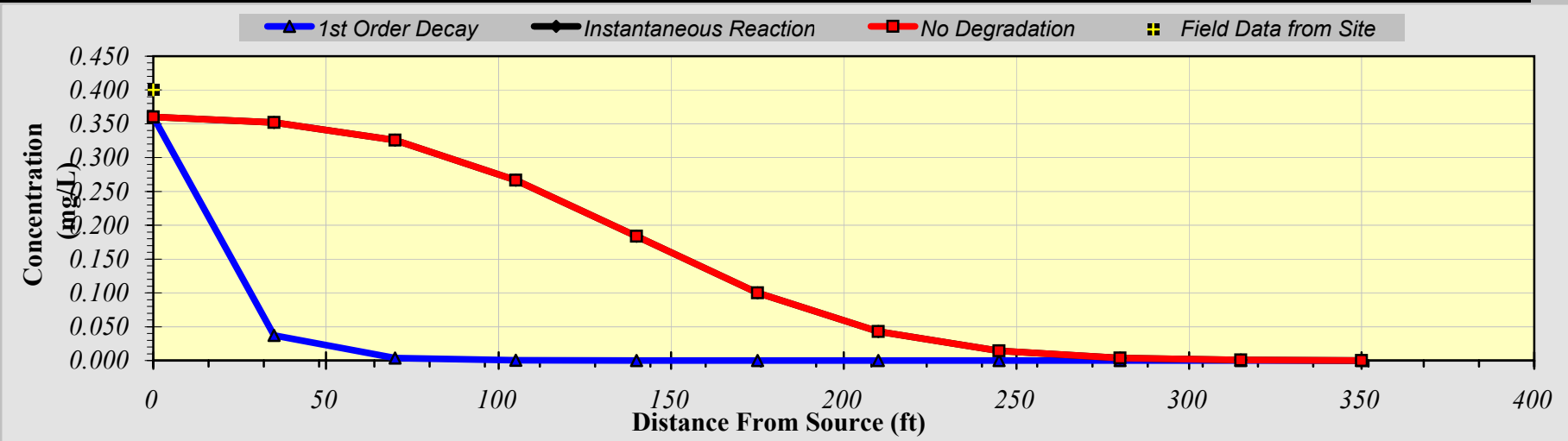
Return to Input

Recalculate This Sheet

Modeling Run 2:
50-year BTEX simulation at 75 ft depth, assuming a 2-year half-life for BTEX;
Redwood Oil Bulk Plant, 455 Yolanda, Santa Rosa, CA

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

	Distance from Source (ft)										
TYPE OF MODEL	0	35	70	105	140	175	210	245	280	315	350
No Degradation	0.360	0.352	0.326	0.267	0.184	0.100	0.043	0.014	0.004	0.001	0.000
1st Order Decay	0.360	0.037	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.360	0.352	0.326	0.267	0.184	0.100	0.043	0.014	0.004	0.001	0.000
Field Data from Site	0.400				0.000						



Calculate Animation

Time: 50 Years

Return to Input

Recalculate This Sheet

Modeling Run 3:
MTBE at 150 ft;
Redwood Oil Bulk Plant, 455 Yolanda, Santa Rosa, CA

BIOSCREEN Natural Attenuation Decision Support System

Air Force Center for Environmental Excellence — *Version 1.4*

Yolanda 150 ft ft
MTBE
Run Name

Data Input Instructions:

115 — *1. Enter value directly....or*
or — *2. Calculate by filling in grey*
0.02 — *cells below. (To restore formulas, hit button below).*

Variable* — *Data used directly in model.*
20 — *Value calculated by model.*
(Don't enter any data).

1. HYDROGEOLOGY

Seepage Velocity*	*Vs*	4.1	*(ft/yr)*
or		or	
Hydraulic Conductivity	*K*	5.0E-05	*(cm/sec)*
Hydraulic Gradient	*i*	0.02	*(ft/ft)*
Porosity	*n*	0.25	*(-)*

2. DISPERSION

Longitudinal Dispersivity	*alpha x*	13.8	*(ft)*
Transverse Dispersivity*	*alpha y*	1.4	*(ft)*
Vertical Dispersivity*	*alpha z*	0.0	*(ft)*
or		or	
Estimated Plume Length	*Lp*	300	*(ft)*

3. ADSORPTION

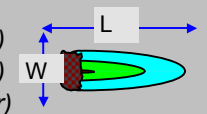
Retardation Factor*	*R*	1.0	*(-)*
or		or	
Soil Bulk Density	*rho*		*(kg/l)*
Partition Coefficient	*Koc*		*(L/kg)*
FractionOrganicCarbon	*foc*		*(-)*

4. BIODEGRADATION

1st Order Decay Coeff*	*lambda*	1.4E-1	*(per yr)*
or		or	
Solute Half-Life	*t-half*	5.00	*(year)*
or Instantaneous Reaction Mode			
Delta Oxygen*	*DO*		*(mg/L)*
Delta Nitrate*	*NO3*		*(mg/L)*
Observed Ferrous Iron*	*Fe2+*		*(mg/L)*
Delta Sulfate*	*SO4*		*(mg/L)*
Observed Methane*	*CH4*		*(mg/L)*

5. GENERAL

Modeled Area Length*	350	*(ft)*
Modeled Area Width*	200	*(ft)*
Simulation Time*	20	*(yr)*



6. SOURCE DATA

Source Thickness in Sat.Zone* 30 *(ft)*

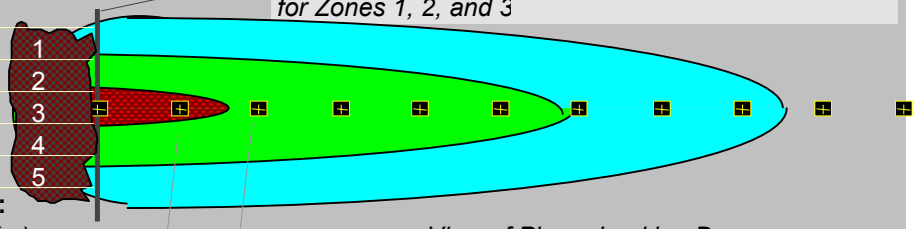
Source Zones:

	Width* (ft)	Conc. (mg/L)*
1		
2		
3	100	1
4	0	0
5	0	0

Source Halflife (see Help):

40	40	*(yr)*
Inst. React.	1st Order	
Soluble Mass	5	*(Kg)*
In Source NAPL, Soil		

Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3



View of Plume Looking Down

Observed Centerline Concentrations at Monitoring Wells
If No Data Leave Blank or Enter "0"

7. FIELD DATA FOR COMPARISON

Concentration (mg/L)	1.0				.05			.003			
Dist. from Source (ft)	0	35	70	105	140	175	210	245	280	315	350

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE — **View Output**

RUN ARRAY — **View Output**

Help

Recalculate This Sheet

Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

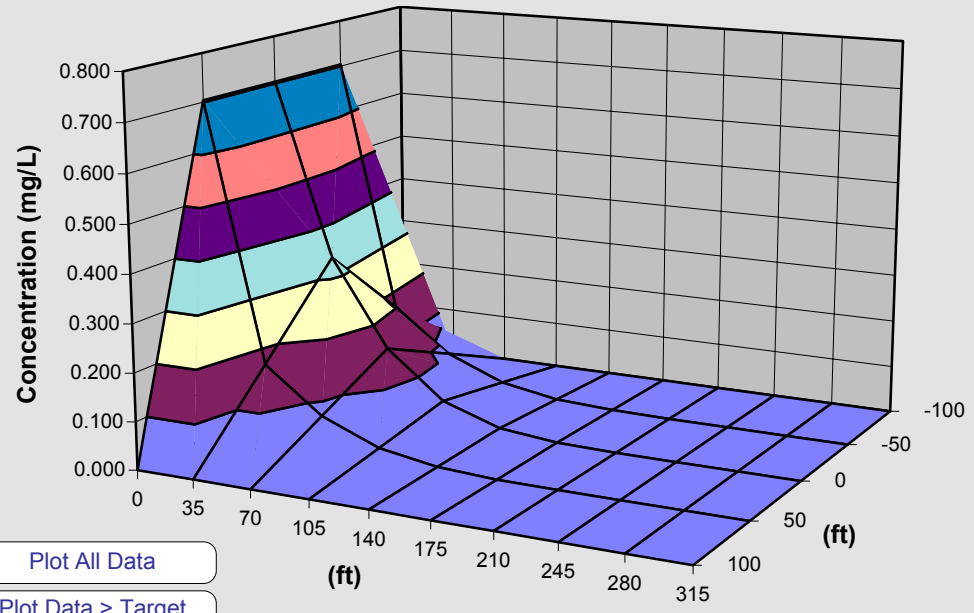
Modeling Run 3:
20-year MTBE Simulation at 150 ft depth, assuming a 5 year half-life for MTBE;
Redwood Oil Bulk Plant, 455 Yolanda, Santa Rosa, CA

DISSOLVED HYDROCARBON CONCENTRATIONS IN PLUME (mg/L at Z=0)

Transverse Distance (ft)	Distance from Source (ft)										
	0	35	70	105	140	175	210	245	280	315	350
100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
50	0.704	0.168	0.077	0.028	0.008	0.001	0.000	0.000	0.000	0.000	0.000
0	0.704	0.337	0.154	0.056	0.015	0.003	0.000	0.000	0.000	0.000	0.000
-50	0.704	0.168	0.077	0.028	0.008	0.001	0.000	0.000	0.000	0.000	0.000
-100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MASS FLUX (mg/day)	2.4E+2	8.1E+1	3.7E+1	1.3E+1	3.7E+0	7.1E-1	9.2E-2	7.5E-3	3.8E-4	1.2E-5	2.2E-7

Model to Display:
- No Degradation Model
- 1st Order Decay Model
- Instantaneous Reaction Model

Time: **20 Years** Target Level: **0.005** mg/L Displayed Model: **1st Order Decay**



Plot All Data
Plot Data > Target

Plume and Source Masses (Order-of-Magnitude Accuracy)

Plume Mass if No Biodegradation	1.5	(Kg)
- Actual Plume Mass	0.7	(Kg)
= Plume Mass Removed by Biodeg	**0.8**	(Kg)
	(52 %)	

Change in Electron Acceptor/Byproduct Masses:

Oxygen	Nitrate	Iron II	Sulfate	Methane	
na	na	na	na	na	(Kg)

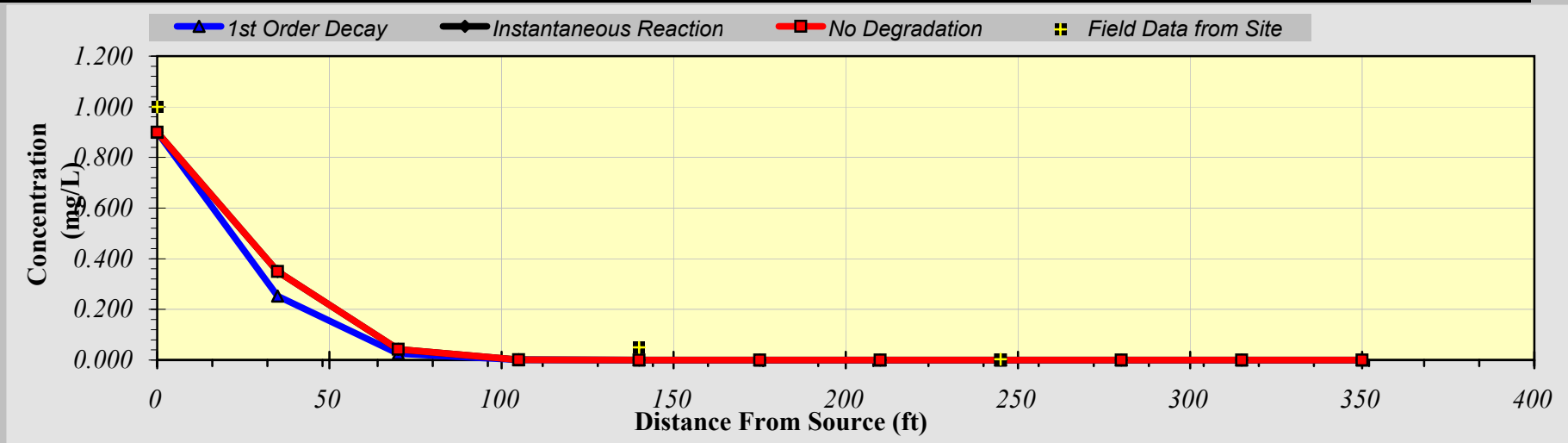
Contam. Mass in Source (t=0 Years)	5.0	(Kg)
Contam. Mass in Source Now (t=20Years)	3.5	(Kg)
Current Volume of Groundwater in Plume	4.5	(ac-ft)
Flowrate of Water Through Source Zone	0.071	(ac-ft/yr)

Mass HELP
Recalculate

Modeling Run 3:
6-year MTBE Simulation at 150 ft depth, assuming a 5-year half-life for MTBE;
Redwood Oil Bulk Plant, 455 Yolanda, Santa Rosa, CA

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

	Distance from Source (ft)										
TYPE OF MODEL	0	35	70	105	140	175	210	245	280	315	350
No Degradation	0.900	0.349	0.042	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1st Order Decay	0.900	0.253	0.025	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.900	0.349	0.042	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site	1.000				0.050			0.003			



Calculate Animation

Time: 6 Years

Return to Input

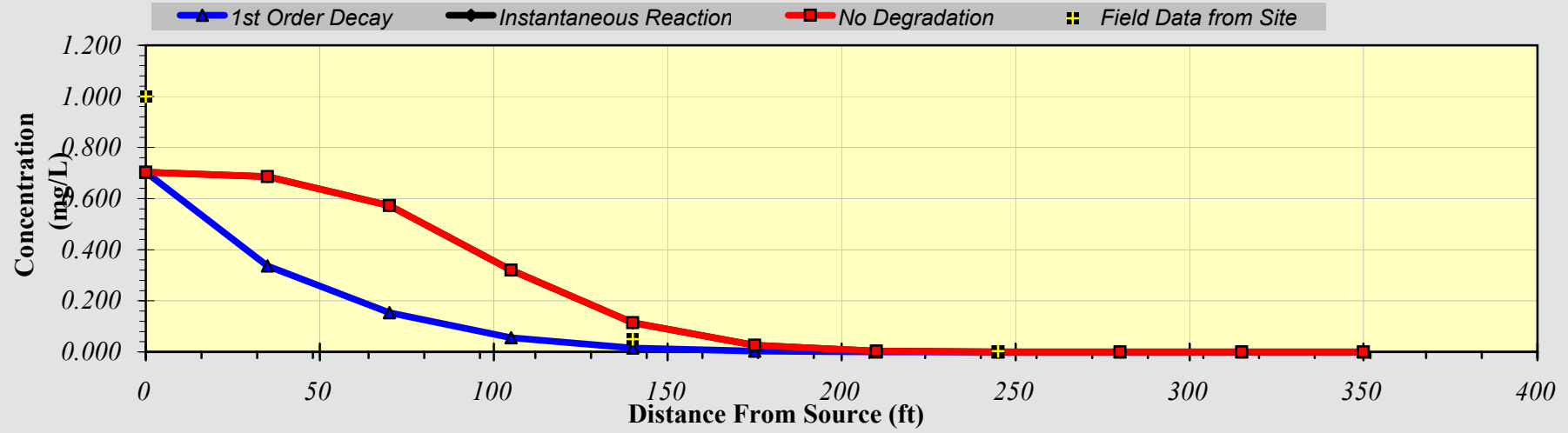
Recalculate This Sheet

Modeling Run 3:
20-year MTBE Simulation at 150 ft depth, assuming a 5-year half-life for MTBE;
Redwood Oil Bulk Plant, 455 Yolanda, Santa Rosa, CA

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	35	70	105	140	175	210	245	280	315	350
No Degradation	0.704	0.687	0.573	0.320	0.115	0.026	0.004	0.000	0.000	0.000	0.000
1st Order Decay	0.704	0.337	0.154	0.056	0.015	0.003	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.704	0.687	0.573	0.320	0.115	0.026	0.004	0.000	0.000	0.000	0.000
Field Data from Site	1.000				0.050			0.003			



Calculate Animation

Time: 20 Years

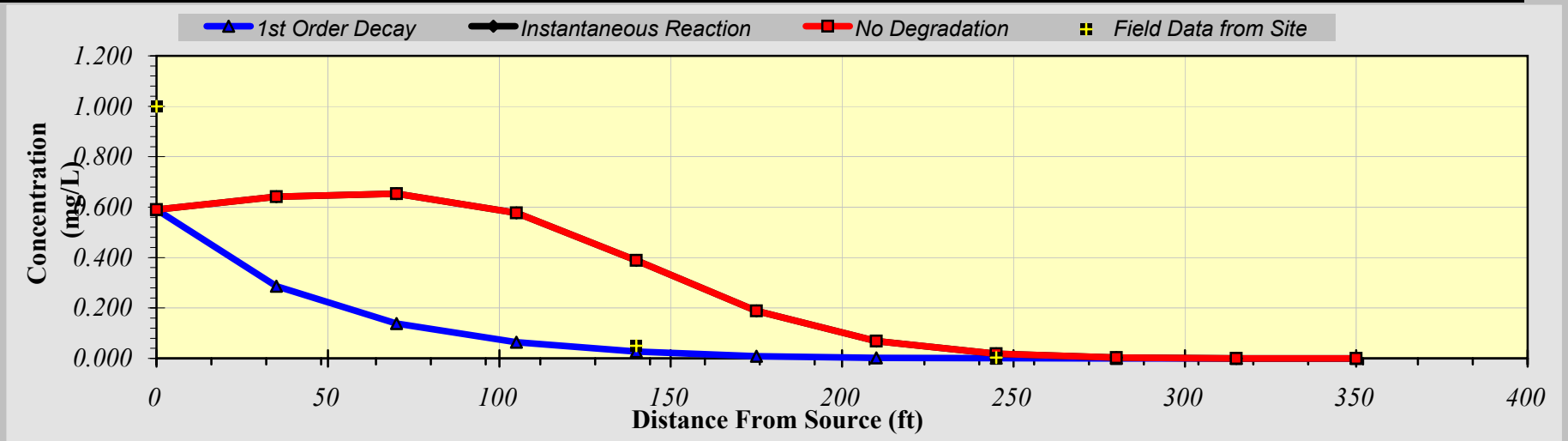
Return to Input

Recalculate This Sheet

Modeling Run 3:
30-year MTBE Simulation at 150 ft depth, assuming a 5-year half-life for MTBE;
Redwood Oil Bulk Plant, 455 Yolanda, Santa Rosa, CA

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

	Distance from Source (ft)										
TYPE OF MODEL	0	35	70	105	140	175	210	245	280	315	350
No Degradation	0.590	0.641	0.653	0.577	0.389	0.188	0.069	0.019	0.004	0.001	0.000
1st Order Decay	0.590	0.286	0.138	0.065	0.027	0.009	0.003	0.001	0.000	0.000	0.000
Inst. Reaction	0.590	0.641	0.653	0.577	0.389	0.188	0.069	0.019	0.004	0.001	0.000
Field Data from Site	1.000				0.050			0.003			



Calculate Animation

Time: 30 Years

Return to Input

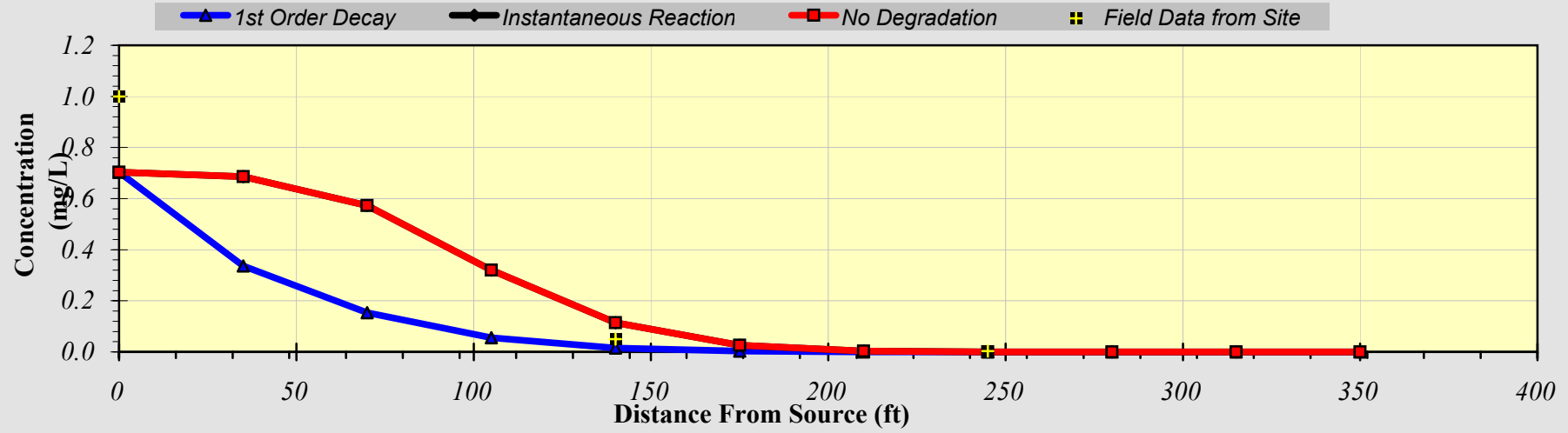
Recalculate This Sheet

Modeling Run 3:
50-year MTBE Simulation at 150 ft depth, assuming a 5-year half-life for MTBE;
Redwood Oil Bulk Plant, 455 Yolanda, Santa Rosa, CA

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	35	70	105	140	175	210	245	280	315	350
No Degradation	0.704	0.687	0.573	0.320	0.115	0.026	0.004	0.000	0.000	0.000	0.000
1st Order Decay	0.704	0.337	0.154	0.056	0.015	0.003	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.704	0.687	0.573	0.320	0.115	0.026	0.004	0.000	0.000	0.000	0.000
Field Data from Site	1.000				0.050			0.003			



Replay Animation | Next Timestep | Prev Timestep

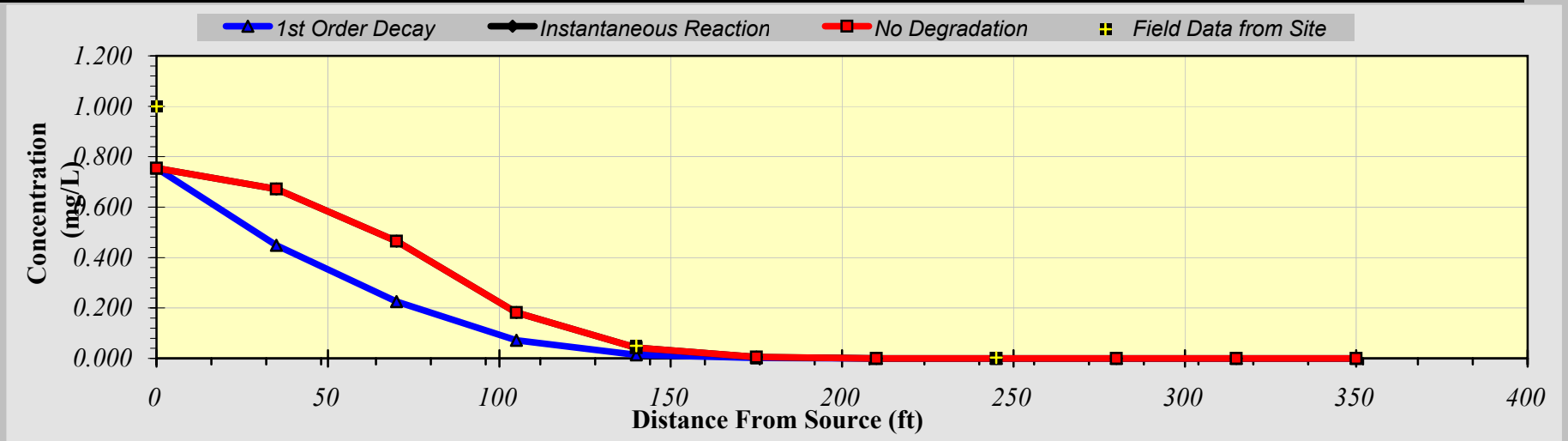
Time: 20 Years

Return to Input | Recalculate This Sheet

Modeling Run 3:
20-year MTBE Simulation at 150 ft depth, assuming a 10-year half-life for MTBE;
Redwood Oil Bulk Plant, 455 Yolanda, Santa Rosa, CA

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

	Distance from Source (ft)										
TYPE OF MODEL	0	35	70	105	140	175	210	245	280	315	350
No Degradation	0.755	0.672	0.465	0.182	0.042	0.005	0.000	0.000	0.000	0.000	0.000
1st Order Decay	0.755	0.449	0.225	0.072	0.015	0.002	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.755	0.672	0.465	0.182	0.042	0.005	0.000	0.000	0.000	0.000	0.000
Field Data from Site	1.000				0.050			0.003			



Calculate Animation

Time: 20 Years

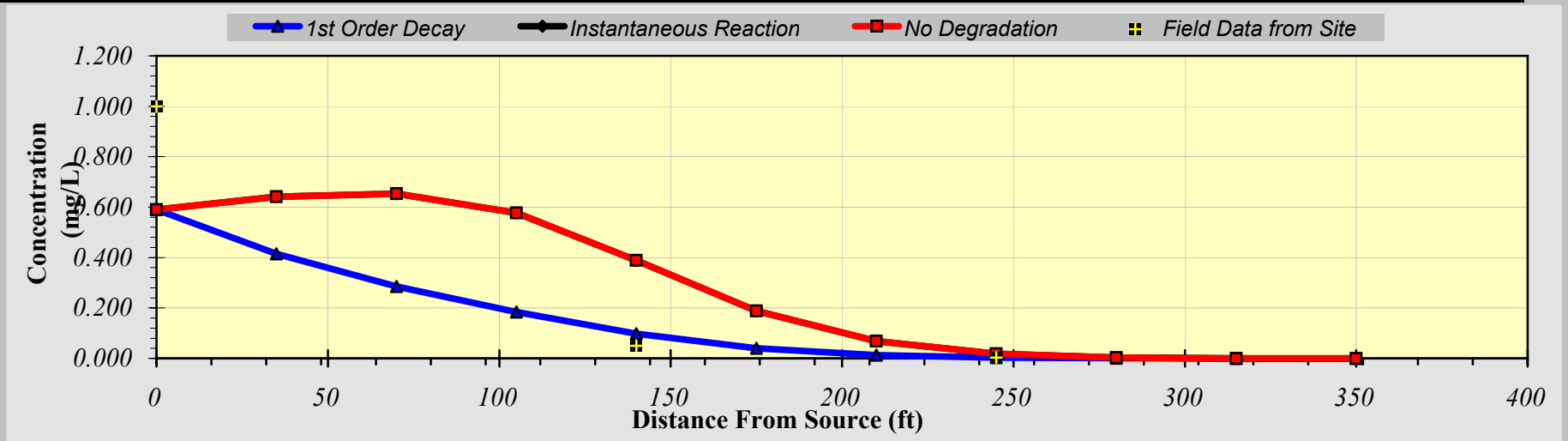
Return to Input

Recalculate This Sheet

Modeling Run 3:
30-year MTBE Simulation at 150 ft depth, assuming a 10-year half-life for MTBE;
Redwood Oil Bulk Plant, 455 Yolanda, Santa Rosa, CA

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

	Distance from Source (ft)										
TYPE OF MODEL	0	35	70	105	140	175	210	245	280	315	350
No Degradation	0.590	0.641	0.653	0.577	0.389	0.188	0.069	0.019	0.004	0.001	0.000
1st Order Decay	0.590	0.415	0.286	0.184	0.099	0.040	0.013	0.003	0.001	0.000	0.000
Inst. Reaction	0.590	0.641	0.653	0.577	0.389	0.188	0.069	0.019	0.004	0.001	0.000
Field Data from Site	1.000				0.050			0.003			



Calculate Animation

Time: 30 Years

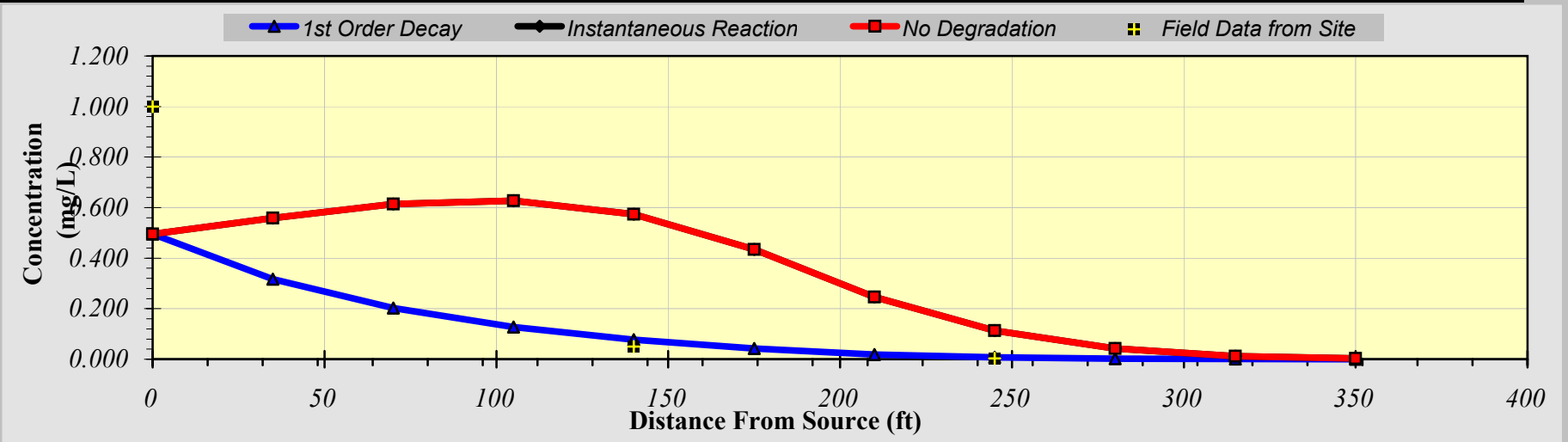
Return to Input

Recalculate This Sheet

Modeling Run 3:
50-year MTBE Simulation at 150 ft depth, assuming a 10-year half-life for MTBE;
Redwood Oil Bulk Plant, 455 Yolanda, Santa Rosa, CA

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

	Distance from Source (ft)										
TYPE OF MODEL	0	35	70	105	140	175	210	245	280	315	350
No Degradation	0.495	0.559	0.614	0.628	0.574	0.434	0.246	0.114	0.042	0.012	0.003
1st Order Decay	0.495	0.317	0.202	0.127	0.077	0.042	0.019	0.007	0.002	0.001	0.000
Inst. Reaction	0.495	0.559	0.614	0.628	0.574	0.434	0.246	0.114	0.042	0.012	0.003
Field Data from Site	1.000				0.050			0.003			



Calculate Animation

Time: 50 Years

Return to Input

Recalculate This Sheet

Modeling Run 4:
BTEX at 150 - 180 ft;
Redwood Oil Bulk Plant, 455 Yolanda, Santa Rosa, CA

BIOSCREEN Natural Attenuation Decision Support System

Air Force Center for Environmental Excellence — *Version 1.4*

Yolanda 150 ft
BTEX
Run Name

Data Input Instructions:

115
or
0.02

1. Enter value directly....or
2. Calculate by filling in grey cells below. (To restore formulas, hit button below).

Variable* — *Data used directly in model.*
20 — *Value calculated by model.*
(Don't enter any data).

1. HYDROGEOLOGY

Seepage Velocity*	*Vs*	4.1	*(ft/yr)*
or		or	
Hydraulic Conductivity	*K*	5.0E-05	*(cm/sec)*
Hydraulic Gradient	*i*	0.02	*(ft/ft)*
Porosity	*n*	0.25	*(-)*

2. DISPERSION

Longitudinal Dispersivity	*alpha x*	13.8	*(ft)*
Transverse Dispersivity*	*alpha y*	1.4	*(ft)*
Vertical Dispersivity*	*alpha z*	0.0	*(ft)*
or		or	
Estimated Plume Length	*Lp*	300	*(ft)*

3. ADSORPTION

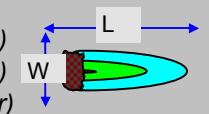
Retardation Factor*	*R*	1.0	*(-)*
or		or	
Soil Bulk Density	*rho*		*(kg/l)*
Partition Coefficient	*Koc*		*(L/kg)*
FractionOrganicCarbon	*foc*		*(-)*

4. BIODEGRADATION

1st Order Decay Coeff*	*lambda*	3.5E-1	*(per yr)*
or		or	
Solute Half-Life	*t-half*	2.00	*(year)*
or Instantaneous Reaction Mode			
Delta Oxygen*	*DO*		*(mg/L)*
Delta Nitrate*	*NO3*		*(mg/L)*
Observed Ferrous Iron*	*Fe2+*		*(mg/L)*
Delta Sulfate*	*SO4*		*(mg/L)*
Observed Methane*	*CH4*		*(mg/L)*

5. GENERAL

Modeled Area Length*	350	*(ft)*
Modeled Area Width*	200	*(ft)*
Simulation Time*	20	*(yr)*



6. SOURCE DATA

Source Thickness in Sat.Zone* 30 *(ft)*

Source Zones:

	Width* (ft)	Conc. (mg/L)*
1		
2		
3	75	0.2
4	0	0
5	0	0

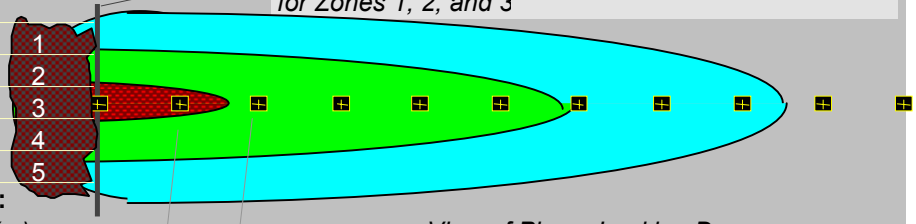
Source Halflife (see Help):

Inst. React.	1st Order
300	300

(yr)

Soluble Mass 5 *(Kg)*
In Source NAPL, Soil

Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3



View of Plume Looking Down

Observed Centerline Concentrations at Monitoring Wells
If No Data Leave Blank or Enter "0"

7. FIELD DATA FOR COMPARISON

Dist. from Source (ft)	Concentration (mg/L)
0	.2
35	
70	
105	
140	.0
175	
210	
245	
280	
315	
350	

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE — **View Output**

RUN ARRAY — **View Output**

Help

Recalculate This Sheet

Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

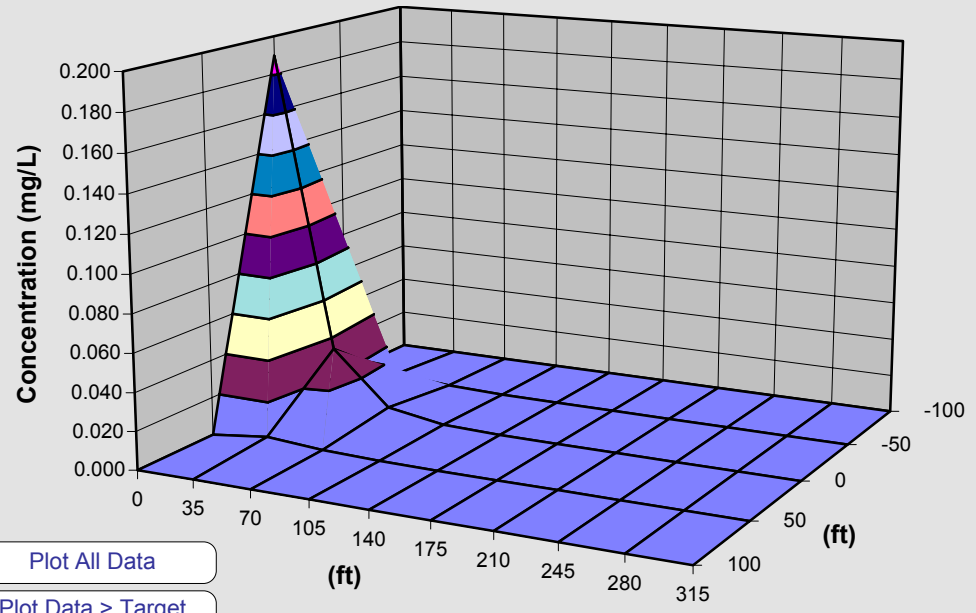
Modeling Run 4:
20-year BTEX Simulation at 150 ft depth, assuming a 2 year half-life for MTBE;
Redwood Oil Bulk Plant, 455 Yolanda, Santa Rosa, CA

DISSOLVED HYDROCARBON CONCENTRATIONS IN PLUME (mg/L at Z=0)

Transverse Distance (ft)	Distance from Source (ft)										
	0	35	70	105	140	175	210	245	280	315	350
100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
50	0.000	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0	0.190	0.034	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-50	0.000	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MASS FLUX (mg/day)	3.6E+1	4.9E+0	1.0E+0	1.8E-1	3.0E-2	4.1E-3	4.2E-4	2.9E-5	1.3E-6	3.9E-8	6.9E-10

Model to Display:
- No Degradation Model
- 1st Order Decay Model
- Instantaneous Reaction Model

Time: **20 Years** Target Level: **0.005** mg/L Displayed Model: **1st Order Decay**



Plot All Data
Plot Data > Target

Plume and Source Masses (Order-of-Magnitude Accuracy)

Plume Mass if No Biodegradation	0.3	(Kg)
- Actual Plume Mass	0.1	(Kg)
= Plume Mass Removed by Biodeg	**0.2**	(Kg)
	(75 %)	

Change in Electron Acceptor/Byproduct Masses:

Oxygen	Nitrate	Iron II	Sulfate	Methane	
na	na	na	na	na	(Kg)

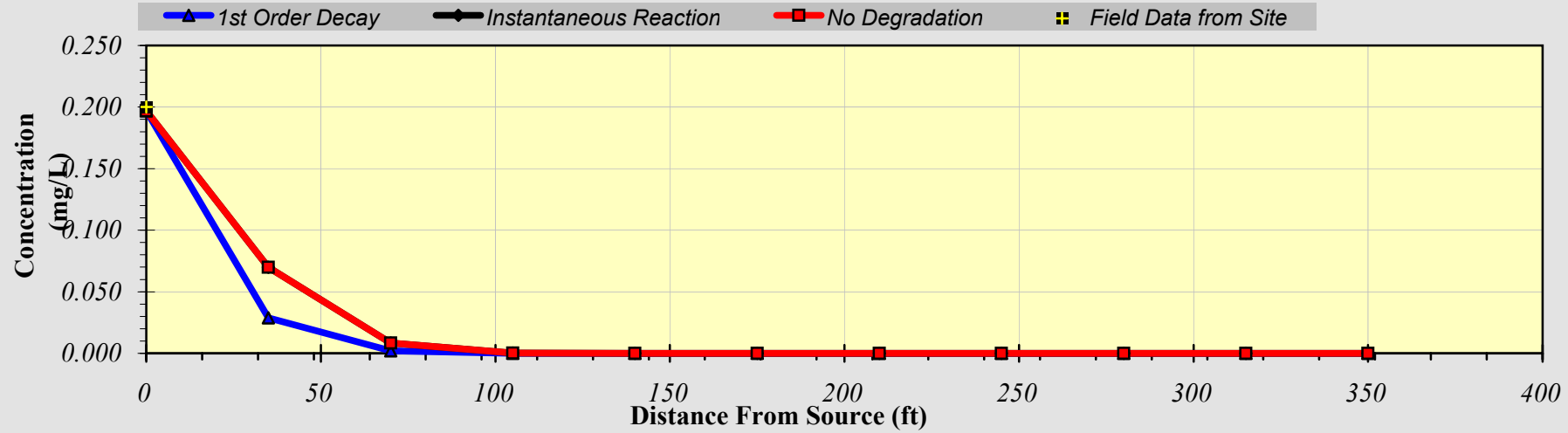
Contam. Mass in Source (t=0 Years)	5.0	(Kg)
Contam. Mass in Source Now (t=20Years)	4.7	(Kg)
Current Volume of Groundwater in Plume	0.9	(ac-ft)
Flowrate of Water Through Source Zone	0.053	(ac-ft/yr)

Mass HELP
Recalculate

Modeling Run 4:
6-year BTEX Simulation at 150 - 180 ft depth, assuming a 2-year half-life for BTEX;
Redwood Oil Bulk Plant, 455 Yolanda, Santa Rosa, CA

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

	Distance from Source (ft)										
TYPE OF MODEL	0	35	70	105	140	175	210	245	280	315	350
No Degradation	0.197	0.070	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1st Order Decay	0.197	0.029	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.197	0.070	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site	0.200										



Calculate Animation

Time: 6 Years

Return to Input

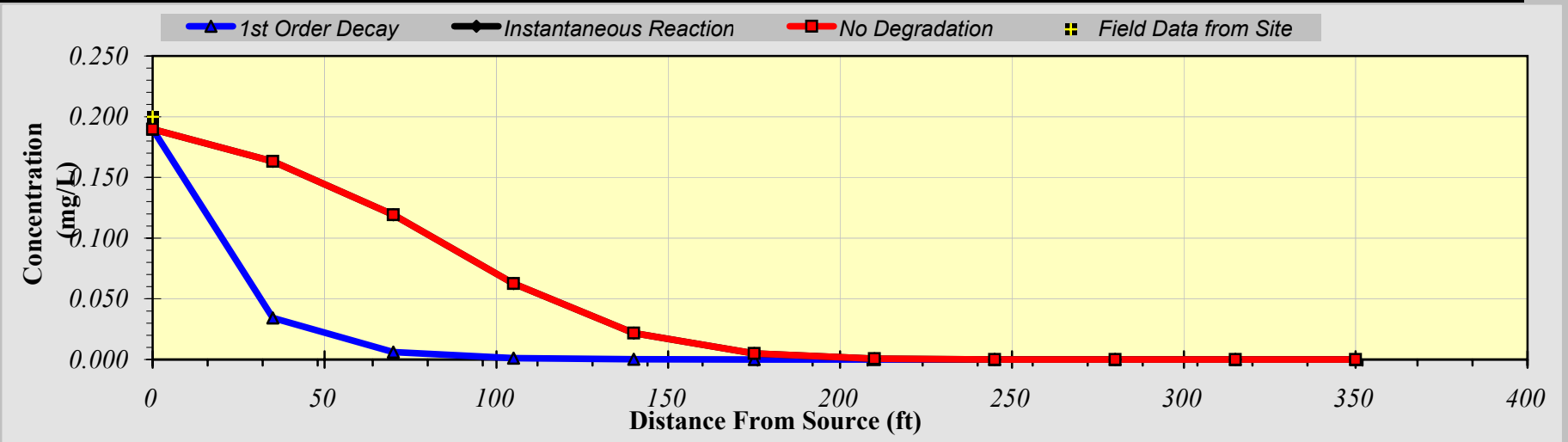
Recalculate This Sheet

Modeling Run 4:
20-year BTEX Simulation at 150 - 180 ft depth, assuming a 2-year half-life for BTEX;
Redwood Oil Bulk Plant, 455 Yolanda, Santa Rosa, CA

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	35	70	105	140	175	210	245	280	315	350
No Degradation	0.190	0.163	0.119	0.062	0.022	0.005	0.001	0.000	0.000	0.000	0.000
1st Order Decay	0.190	0.034	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.190	0.163	0.119	0.062	0.022	0.005	0.001	0.000	0.000	0.000	0.000
Field Data from Site	0.200										



Calculate Animation

Time: 20 Years

Return to Input

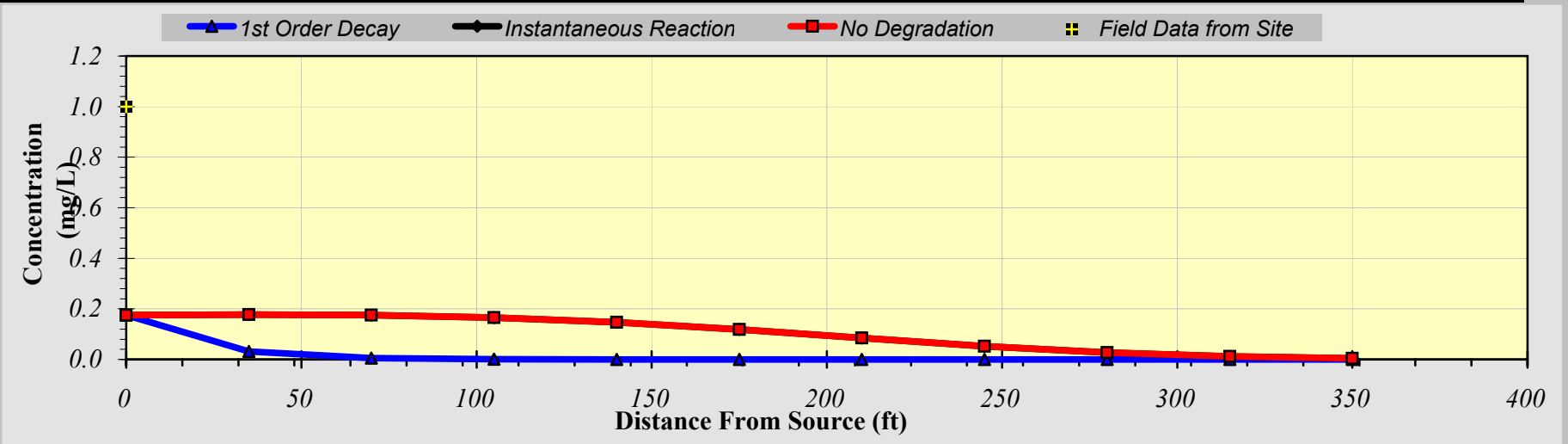
Recalculate This Sheet

Modeling Run 4:
50-year BTEX Simulation at 150 - 180 ft depth, assuming a 2-year half-life for BTEX;
Redwood Oil Bulk Plant, 455 Yolanda, Santa Rosa, CA

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	35	70	105	140	175	210	245	280	315	350
No Degradation	0.175	0.177	0.176	0.166	0.147	0.119	0.085	0.052	0.027	0.012	0.005
1st Order Decay	0.175	0.032	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Inst. Reaction	0.175	0.177	0.176	0.166	0.147	0.119	0.085	0.052	0.027	0.012	0.005
Field Data from Site	1.000										



Calculate Animation

Time: 50 Years

Return to Input

Recalculate This Sheet

APPENDIX E
CALCULATION OF CONTAMINANT MASS

Calculation of Contaminant Mass Remaining in Soil
455 Yolanda, Santa Rosa, California

Figures 13 through 15, Appendix A, show excavated areas and sampling locations used in these calculations. Table 7, Appendix B, shows analytical laboratory results used in these calculations.

Assumptions: Impacted area of the site is divided into three zones:

Zone 1: Heavily impacted area adjacent to former northern tank cluster
Zone 2: Heavily impacted area adjacent to former southern tank cluster
Zone 3: Remainder of impacted soil at site.

Zone 1: Average concentration in Zone 1, based on average concentration of the 13 sidewall samples from removal of northern tank cluster: 4,560 mg/kg.

Volume and mass of soil in Zone 1: Assume zone 1 extends 10 ft on all sides from the tank excavation. Assume depth of impacted soil is approximately 16 ft to 21 ft bgs, or 5 ft in depth.
Volume of Zone 1 soil is therefore:
$[((100 \text{ ft} \times 10 \text{ ft} \times 2) + (50 \text{ ft} \times 10 \text{ ft} \times 2) \times 5 \text{ ft})) \div 27 \text{ ft}^3/\text{CY}] \cong 550 \text{ CY}$
Assume mass of soil is approximately 1,360 kg/CY.
Mass of impacted soil in Zone 1 is therefore 7.5×10^5 kg

Total contaminant mass in Zone 1:
$(7.5 \times 10^5 \text{ kg}) \times 4{,}560 \text{ mg/kg} \times 10^{-6} \text{ kg/mg} \cong \underline{3{,}400 \text{ kg}}$

Zone 2: Average concentration in Zone 2, based on average concentration of the 13 sidewall samples and bottom samples from removal of southern tank cluster:
660 mg/kg.
Volume and mass of soil in Zone 2: Assume Zone 2 extends 10 ft on all sides from the tank excavation. Assume depth of impacted soil is approximately 13 ft to 18 ft bgs, or 5 ft in depth.
Volume of Zone 2 soil is therefore:
$[((50 \text{ ft} \times 10 \text{ ft} \times 2) + (40 \text{ ft} \times 10 \text{ ft} \times 2) \times 5 \text{ ft})) \div 27 \text{ ft}^3/\text{CY}] \cong 300 \text{ CY}$
Assume mass of soil is approximately 1,360 kg/CY.
Mass of impacted soil in Zone 2 is therefore 4×10^5 kg

Total contaminant mass in Zone 2:
$(4 \times 10^5 \text{ kg}) \times 660 \text{ mg/kg} \times 10^{-6} \text{ kg/mg} \cong \underline{250 \text{ kg}}$

Zone 3: Average concentration in Zone 3, based on average concentration of the 66 samples from the January 2000 geoprobe investigation: 45 mg/kg.

Assume area of Zone 3 is approximately 250 ft x 130 ft. Based on the January, 2000 geoprobe investigation, impacted zone extends from approximately 10 ft to 20 ft bgs. Zone 3 encompasses the area of soil excavated during the removal of the northern and southern tank clusters:
Northern tank cluster excavation dimensions:
(100 ft x 50 ft x 20 ft depth) ÷ 27 CY/ft^3 ≅3,700 CY
Area excavated below 10 ft depth: 3,700 CY ÷ 2 ≅1,900 CY
Southern tank cluster excavation dimensions:
(50 ft x 40 ft x 15 ft depth) ÷ 27 CY/ft^3 ≅1,000 CY
Area excavated below 10 ft depth: 1,000 CY ÷ 4 ≅250 CY
Total volume of Zone 3 soil:
[(250 ft x 130 ft x 10 ft) ÷ 27 CY/ft^3] - 2,150 CY ≅ 10,000 CY

Assume mass of soil is approximately 1,360 kg/CY.
Mass of impacted soil in Zone 3 is therefore:
10,000 CY x 1,360 kg/CY ≅1.3 x 10^7 kg

Total contaminant mass in Zone 3:
(1.3 x 10^7 kg) x 45 mg/kg x 10^{-6} kg/mg ≅ 60 kg

Total contaminant mass prior to implementation of SVE system is therefore:

3,400 kg (Zone 1) + 250 kg (Zone 2) + 60 kg (Zone 3) ≅3,700 kg.

The SVE system removed an estimated 1,100 kg of contaminants. Remaining contaminant mass is therefore: 3,700 Kg - 1,100 kg ≅2,600 kg.

To account for potential variations in sampling data, a factor of 0.5 to 1.5 may be applied to this estimate. Total estimated mass of hydrocarbons remaining in site soil is therefore estimated at 1,500 kg to 4,000 kg.

APPENDIX F
WELL LOGS

DW-2

ORIGINAL
File with DWR

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

Do Not Fill In

No. 116454

State Well No. _____

Other Well No. 7N/8W-35 B

(1) OWNER:

Name H.R. Gantner
Address P.O. Box 428
Santa Rosa, Ca. 95402

(2) LOCATION OF WELL:

County Sonoma — Owner's number, if any
Township, Range, and Section 455 Yolanda Ave
Distance from cities, roads, railroads, etc. Santa Rosa, Calif.

(3) TYPE OF WORK (check):

New Well [X] Deepening [ ] Reconditioning [ ] Destroying [ ]
If destruction, describe material and procedure in Item 11.

(4) PROPOSED USE (check):

Domestic [X] Industrial [ ] Municipal [ ]
Irrigation [ ] Test Well [ ] Other [ ]

(5) EQUIPMENT:

Rotary [X]
Cable [ ]
Other [ ]

(6) CASING INSTALLED:

STEEL: X OTHER:
SINGLE [X] DOUBLE [ ]

From ft.	To ft.	Diam.	Gage or Wall	Diameter of Bore	From ft.	To ft.
0	180	6"	10ga	9 7/8	0	180

If gravel packed

Size of shoe or well ring: _____ Size of gravel: 3/8"
Describe joint Welded

(7) PERFORATIONS OR SCREEN:

Type of perforation or name of screen Torch

From ft.	To ft.	Perf. per row	Rows per ft.	Size in. x in.
140	180	1	4	3/16 x 6

(8) CONSTRUCTION:

Was a surface sanitary seal provided? Yes [X] No [ ] To what depth 61' ft.
Were any strata sealed against pollution? Yes [ ] No [ ] If yes, note depth of strata
From ft. to ft.
From ft. to ft.
Method of sealing concrete opn pack

(9) WATER LEVELS:

Depth at which water was first found, if known ft.
Standing level before perforating, if known ft.
Standing level after perforating and developing 60' ft.

(10) WELL TESTS:

Was pump test made? Yes [ ] No [X] If yes, by whom? Bail
_ld: 20 gal./min. with 60 ft. drawdown after hrs.
Temperature of water cool Was a chemical analysis made? Yes [ ] No [X]
Was electric log made of well? Yes [ ] No [X] If yes, attach copy

(11) WELL LOG:

Total depth 180 ft. Depth of completed well 180 ft.
Formation: *Describe by color, character, size of material, and structure*

ft. to	ft.
0 - 1	Fill
1 - 22	Clay
22 - 89	Fractured Rock (Volcanic)
89 - 142	Volcanic ash, rock seams
142 - 158	Rock(Fractured)
158 - 180	Volcanic conglomerate

Work started 3/7/ 1974 , Completed 3/9/74 19

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the bes of my knowledge and belief.

NAME Weeks Drilling & Pump Co.
(Person, firm, or corporation) (*Typed or printed*)
Address 6100 Sebastopol Rd.
Sebastopol, Calif. 95472
[SIGNED] Gerald G. Thompson
By Mary E. Thompson (Well Driller)
License No. 177681 Dated _____, 19

SKETCH LOCATION OF WELL ON REVERSE SIDE

CONFIDENTIAL LOG
Water Code Sec. 13752

67139-750 8-72 30M TRIP

DW-1

...INAL
...with DWR

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
WATER WELL DRILLERS REPORT

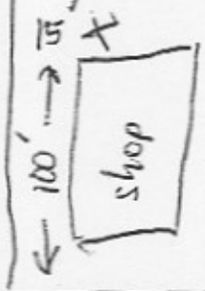
Do not fill in
No. 34318

...of Intent No.
Local Permit No. or Date
State Well No.
Other Well No. 7N/8W-35

(1) OWNER: Name Mel Acquitapace
Address 134 Middle Rincon Rd
City Santa Rosa Zip 95405

(2) LOCATION OF WELL (See instructions):
County Sonoma Owner's Well Number
Well address if different from above 459 Yolanda Ave.
Township Santa Rosa Range Section
Distance from cities, roads, railroads, fences, etc. 110' from the prop. Line on Yolanda on the North side 15' East of prop. line adjacent to Gantner oil Co.

Pacific Telephone storage



WELL LOCATION SKETCH

(3) TYPE OF WORK:
New Well [X] Deepening [ ]
Reconstruction [ ]
Reconditioning [ ]
Horizontal Well [ ]
Destruction [ ] (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic [ ]
Irrigation [ ]
Industrial [X]
Test Well [ ]
Stock [ ]
Municipal [ ]
Other [ ]

(5) EQUIPMENT:
Rotary [ ] Reverse [ ]
Cable [X] Air [ ]
Other [ ] Bucket [ ]

(6) GRAVEL PACK:
Yes [ ] No [X] Size
Diameter of bore
Packed from to ft.

(7) CASING INSTALLED:
Steel [X] Plastic [ ] Concrete [ ]

(8) PERFORATIONS:
Type of perforation or size of screen

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
0	134	6 5/8	.188	x94	134	1/8 x 4

(9) WELL SEAL:
Was surface sanitary seal provided? Yes [X] No [ ] If yes, to depth 20 ft.
Were strata sealed against pollution? Yes [ ] No [X] Interval ft.
Method of sealing

(10) WATER LEVELS:
Depth of first water, if known ft.
Standing level after well completion 30 ft.

(11) WELL TESTS:
Was well test made? Yes [X] No [ ] If yes, by whom? Driller
Type of test Pump [ ] Bailer [ ] Air lift [ ]
Depth to water at start of test 30 ft. At end of test 125 ft.
Discharge 12 gal/min after 1 hours Water temperature
Chemical analysis made? Yes [ ] No [X] If yes, by whom?
Was electric log made? Yes [ ] No [X] If yes, attach copy to this report

(12) WELL LOG: Total depth 134 ft. Depth of completed well 134 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
0	5	adobe clay
5	20	brown gravely clay
20	48	grey gravely clay
48	52	yellow gravely clay
52	95	grey gravely clay
95	134	brown gravely clay

Work started 5/16 19 77 Completed 5/21 19 77

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief
Signed (Well Driller)
NAME NUTTING & JENSSEN DRILLING
(Person, firm, or corporation) (Typed or printed)
Address Sebastopol, Calif
City 1924 Gravenstein Hwy. So 95472
License No. 285516 Date of this report June 1, 197

DWR 188 (REV. 7-76) IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM 43816-990 7-76 50M QUAD